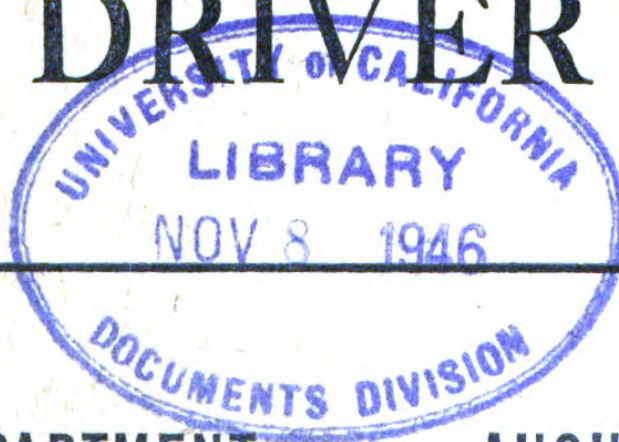


TM 21-306

WAR DEPARTMENT TECHNICAL MANUA

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MANUAL for the FULL-TRACK VEHICLE DRIVER



WAR DEPARTMENT

AUGUST 1946

WAR DEPARTMENT TECHNICAL MANUAL
TM 21-306

MANUAL
for the
FULL-TRACK
VEHICLE DRIVER



WAR DEPARTMENT

AUGUST 1946

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WAR DEPARTMENT

WASHINGTON 25, D. C., 21 August 1946

TM 21-306, Manual for the Full-Track Vehicle Driver, is published for the information and guidance of all concerned.

[AG 300.7 (20 Jun 46)]

BY ORDER OF THE SECRETARY OF WAR:

DWIGHT D. EISENHOWER,
Chief of Staff

OFFICIAL:

EDWARD F. WITSELL,
Major General
The Adjutant General

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For explanation of distribution formula, see FM 21-6.

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III



CHAPTER 1

GENERAL

1. PURPOSE AND SCOPE. **a. Purpose.** The purpose of this manual is to so familiarize you with the essentials of full-track vehicle operation and your duties as a driver that they become second nature. You must know the capabilities of your vehicle as well as you know the capabilities of your own body. You must achieve the ability to drive your vehicle as confidently and as efficiently as you direct your body to walk or run. In combat, there is often not time to think things over; consequently you must be able to act automatically and correctly. A study of this manual will not only point out the mistakes you are making in your driving, but also how to avoid them, and thereby improve your driving skill.

b. Scope. This manual includes training in maintenance and field expedients, in flat terrain driving, in cross-country driving, and in combat driving. Accompanying these are allied subjects: mounted and dismounted signals for full-track vehicles, types of formations, driver and gunner cooperation, and vehicular concealment.

2. REFERENCES. **a.** The Technical Manual for your vehicle—check and see if you have it. If you do not have it in your vehicle, ask your maintenance

sergeant to get you one. It tells you how this precision instrument (your vehicle) operates; tells you of its capabilities and its limitations.

b. TM 37-2810 informs you where to look for trouble and how to correct it. It can be obtained from your orderly room or from your maintenance sergeant.

c. This manual for the full-track vehicle driver is a handy reference. Use it in addition to the two manuals mentioned above. Study all three. They will teach you the vehicular nomenclature and functioning, care and maintenance, and the principles of expert driving.

3. TEAMWORK. The success of a combat vehicle in field exercises or in battle is dependent upon how skillfully the crew members operate as a team.

a. **Crew drill and service of piece.** (1) Crew drill helps to achieve orderly, disciplined, efficient execution of mounted and dismounted action; and precision, accuracy, and speed in the service of the piece. It provides a logical and thorough routine for all inspections of the vehicle and its equipment.

(2) Get the crew drill manual pertaining to your vehicle from the orderly room, and study it.

b. **Interphone communications.** The achievement of perfect teamwork requires a thorough knowledge of interphone procedure, language, and equipment, and the highest degree of discipline.

(1) *Procedure.* After mounting the vehicle, headsets and microphones are put on and tested as follows:

(a) Each crew member plugs in his headset and microphone cords.

(b) The commander orders: CHECK INTERPHONE. Each crew member calls the designation of his position, followed by the word "CHECK." Example: "GUNNER, CHECK." The sequence of reporting is as follows:

Gunner

Bog

Driver

Cannoneer

During this procedure, each crew member adjusts the volume control on his interphone control box to the desired level. Care must be taken that the microphone switch does not remain in the locked position.

CAUTION: All crewmen should understand that, by pressing their microphone switch, all external radio communication is interrupted. *Therefore*, if the commander is transmitting or receiving a radio message, the microphone switch should be pressed to talk *only in case of an emergency*.

(2) *Interphone language.* Efficient operation demands that interphone conversation be kept to the minimum. The following terms are prescribed for interphone language:

(a) Terms.

Tank commander	LIEUTENANT or SERGEANT
Driver	DRIVER
Gunner	GUNNER
Cannoneer	LOADER
Bow gunner	BOG
Any tank	TANK
Armored car.....	ARMORED CAR
Any unarmored vehicle.....	TRUCK
Any antitank gun.....	ANTITANK
Infantry	DOUGHS
Machine gun.....	MACHINE GUN
Airplane	PLANE

(b) *Commands for movement of tank.*

To move forward...DRIVER MOVE OUT
To halt.....DRIVER STOP
To reverse.....DRIVER REVERSE
To increase speed...DRIVER SPEED UP
To decrease speed.....
DRIVER SLOW DOWN
To have driver move toward a terrain
feature or reference point, the tank
being headed in proper direction.....
DRIVER MARCH ON WHITE HOUSE
(HILL, DEAD TREE, ETC.)
To turn right (left).....
DRIVER RIGHT (LEFT)

To follow in column.....
 DRIVER FOLLOW THAT TANK
 (DRIVER FOLLOW TANK No. B-9)
 To follow on road or trail.....
 DRIVER FOLLOW ROAD
 (DRIVER FOLLOW TRAIL)
 To start engine.....
 DRIVER TURN IT OVER
 To stop engine.....DRIVER CUT ENGINE
 To proceed in a specific gear.....
 DRIVER THIRD GEAR
 (FIRST GEAR) (FOURTH GEAR)
 To proceed at same speed.....
 DRIVER STEADY

(c) *Commands for control of turret.*

To traverse turret.....
 GUNNER TRAVERSE LEFT (RIGHT)
 To stop turret traverse.....
 GUNNER STEADY... ON

c. Formations. Formations (fig. 1) are used to facilitate the movement of a section, platoon, or larger element from one place to another—on the road, in field problems, or in combat. The section or platoon leader selects the type of formation which will best enable the unit to accomplish its mission. The choice is dependent on the need for control, security, and fire power; and on the terrain and information of the enemy, real or simulated. Maximum benefits can be gained from each

type of formation only through repeated drill. In this way teamwork is achieved within the vehicle crew and the unit. The characteristics of each type of formation are:

(1) *Line.* (a) Affords maximum fire power to the front or rear.

(b) Is difficult to control without good visual contact.

(c) Affords no reserve for sustaining action within the formation.

(d) Is used by elements in supporting or covering positions and when emerging from smoke, crossing crests, or leaving woods under adequate supporting fire.

(2) *Column.* (a) Affords minimum fire power to the front.

(b) Allows maximum control.

(c) Permits rapid deployment to other formations.

(d) Is used in approach marches, night movements, fog, defiles, and dense woods.

(3) *Line of sections.* (a) Affords fire power to the front and flanks.

(b) Is easier to control than line, wedge, or echelon.

(c) Permits further deployment to the front or flanks and lends itself readily to movement by bounds or fire and maneuver.

(d) Is used in wide defiles or sparse woods and

in last stages of an approach march.

(4) *Wedge.* (a) Affords good fire power to the front and flanks.

(b) Provides good directional control, but the control depends largely upon visual contact between adjacent vehicles.

(c) Lends itself readily to movement by bounds or fire and maneuver.

(d) Is used prior to contact when the platoon leader wants to maintain maximum control though deployed.

(5) *Inverted wedge.* (a) Permits good fire power to the front, flanks, and rear.

(b) Depends on radio and complete visual contact for control of direction of movement.

(c) Permits the platoon leader to observe and control the maneuver and fire of the platoon without becoming engaged too soon himself.

(d) May be used when the platoon leader desires to control the concentrated fire power to the front.

(6) *Echelon right (left).* (a) Affords maximum fire power to the right (left) front.

(b) Is difficult to control without good visual contact.

(c) May be used on the exposed flank of a larger formation.

4. DRIVER SELECTION. Before being selected for driver training you will be given an aptitude test.

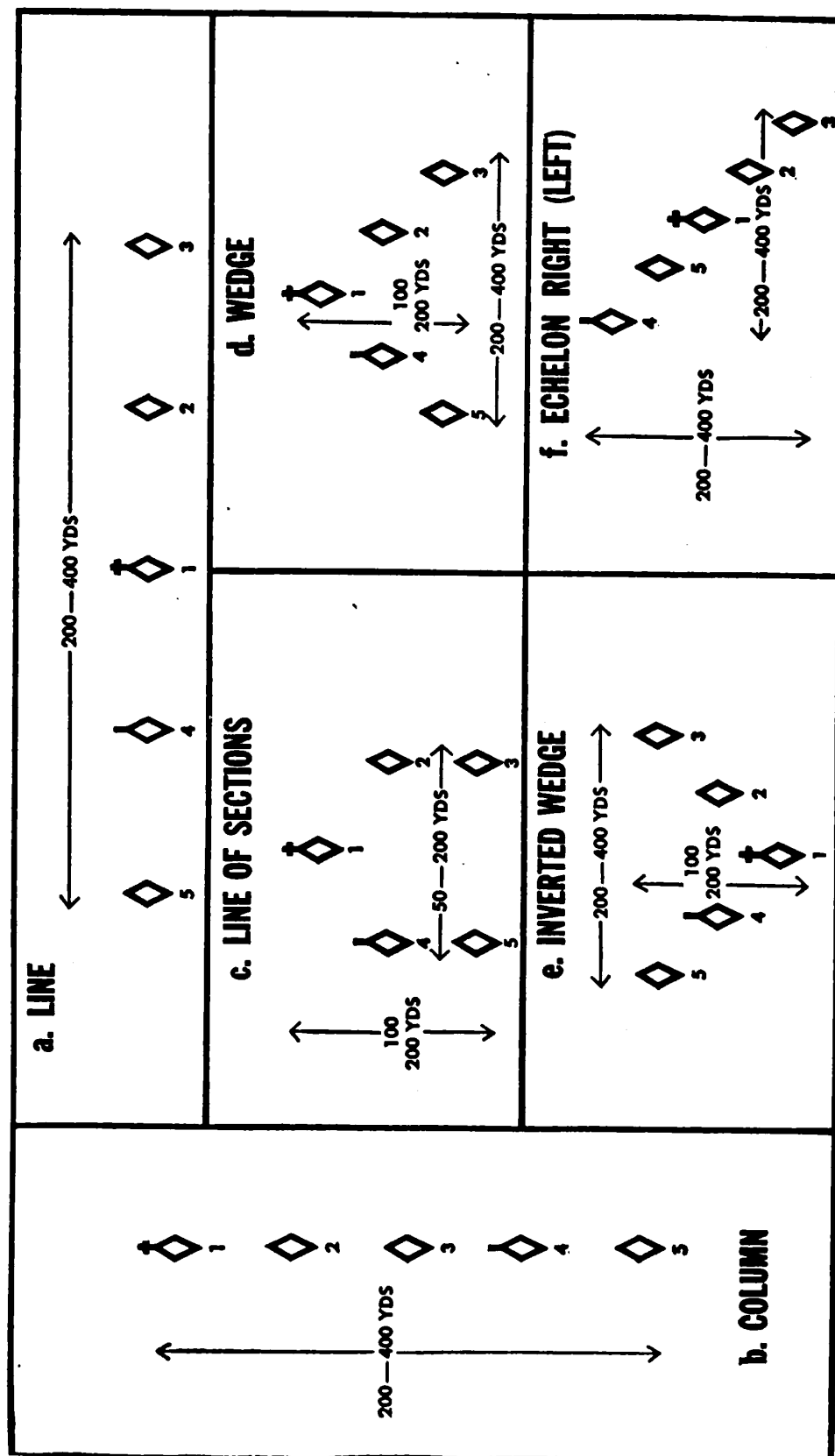


Figure 1. Basic platoon formations.

This test determines your mental and physical fitness to qualify as an Army driver. The test measures your reaction time by determining how long it takes you to put on the brakes when something appears suddenly on the road in front of you. It tests your vision by determining whether you see well, by day and by night. Finally, it checks to ascertain if your physical condition can withstand the rigors of Army driving.

5. PHASES OF DRIVER TRAINING. Driver training is arranged in a series of phases ranging from simple first steps to the complete act of combat driving. Each phase of training must be mastered before going to the next.

a. Preliminary nonmechanical training. After you have passed the aptitude test you will be given a course of instruction. You learn the signals that every driver must use and recognize, the general rules of the road, and safety precautions. You learn march discipline and why it is necessary and also, how to fill out and use trip tickets and accident reports.

b. Preliminary mechanical training. (1) In this phase you are taught the names of the principal parts of the vehicle, how they operate and, most important, the action to be taken to keep the vehicle in good working condition. These services make up first echelon (driver) maintenance.

(2) After instruction in driver maintenance

and inspection, you learn how to prevent vehicular abuse, how to operate the controls, and the meaning and application of the instrument readings. You learn how to start, warm up, cool off, and stop your vehicle.

c. Flat terrain driving. When you have finished preliminary instruction you are ready to drive. Initial driving, in first, second, and reverse gears in order to get the feel of the controls, is accomplished on a comparatively level field.

d. Rough terrain driving. After you become skilled in the operation of the vehicular controls, you are ready to progress from flat terrain driving to cross-country driving over rolling terrain. There are other drivers on the same course. Do not try to keep a fixed distance from the vehicle ahead; keep sufficient distance so that you can select the proper speeds and gear ratios. Do not follow the tank ahead of you blindly. He may be wrong. Do what you think *you* should do. This phase includes obstacle driving, road convoy driving, driving buttoned up, driving with gas masks, and driving at night.

e. Field expedients. In this phase you become familiar with the use of field expedients (the ways and means used to return a temporarily disabled vehicle to action with the tools and materials available in the field).

f. Combat driving. After you have learned to

operate your vehicle on all kinds of terrain, in all kinds of weather, and under all conditions of visibility, you are ready to start tactical or combat driving. In this phase, you learn how to employ your vehicular armament to destroy the enemy while receiving the least possible damage to your own vehicle.

CHAPTER 2

PRELIMINARY NONMECHANICAL TRAINING

6. VISUAL SIGNALS. Arm and hand, light, and flag signals are extremely important for purposes of control. You must know the meaning and use of these signals.

a. Arm and hand signals. Arm and hand signals are given directly to you, the driver, or the vehicle commander. You must be able to execute at once the action indicated by the signals. You and the tank commander make up a team. This team constantly uses arm and hand signals when loading onto, and unloading from landing craft, flat cars, and tank transporters or when moving in any restricted space. For basic signals see TM 21-305. Additional arm and hand signals for control of full-track vehicles are shown in figures 2 and 3.

b. Light signals and flag signals. These signals are shown in figures 4 and 5. Flag signals can be seen at greater distances than arm and hand signals; therefore they may be used in field exercises or in combat when operating under radio silence.

7. RULES OF ROAD AND SAFETY PRECAUTIONS. a. When halting or closing up, always stay at least one vehicle length in back of the vehicle in front of you and keep at least the width of a vehicle between you and the vehicle to either side.

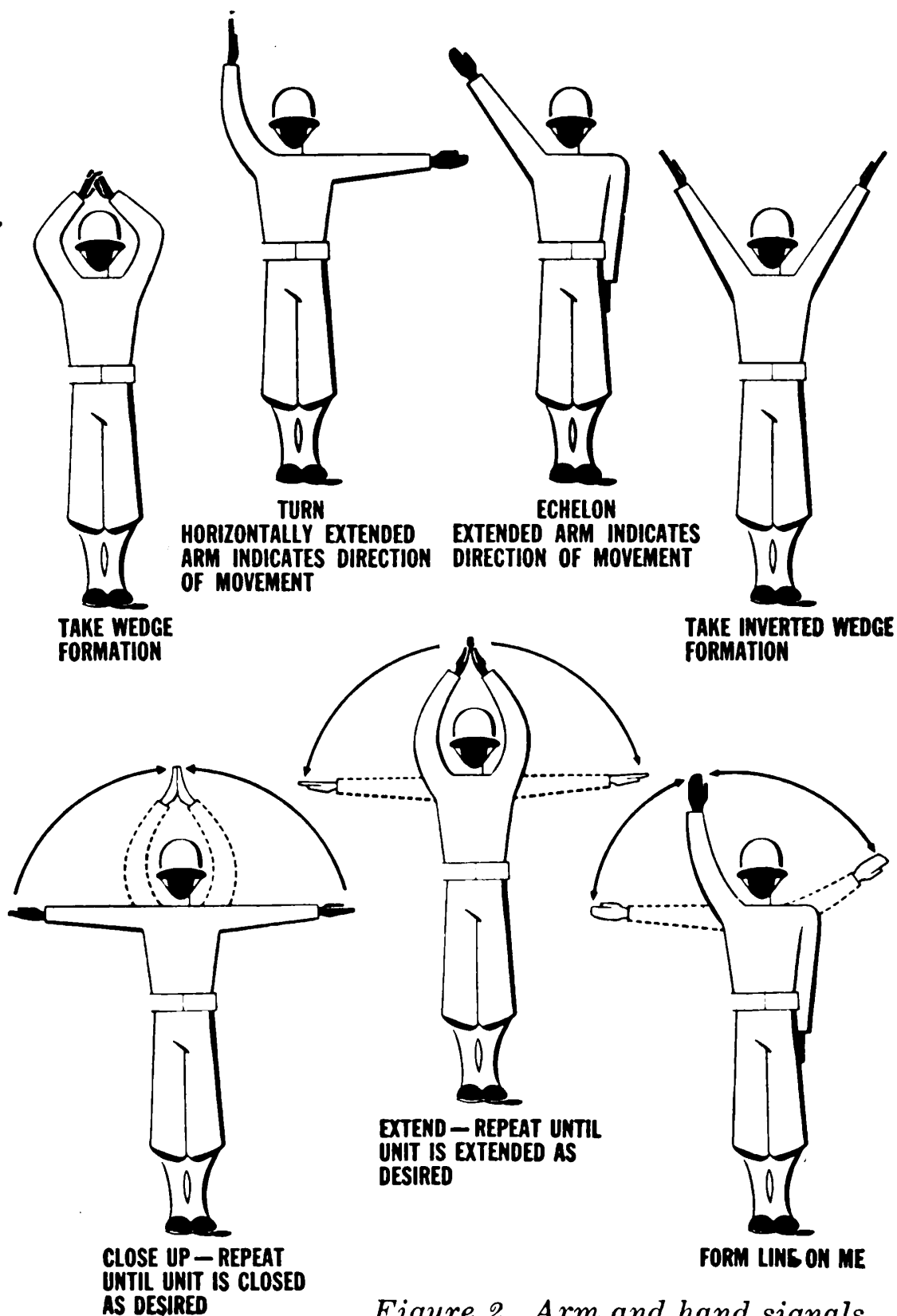
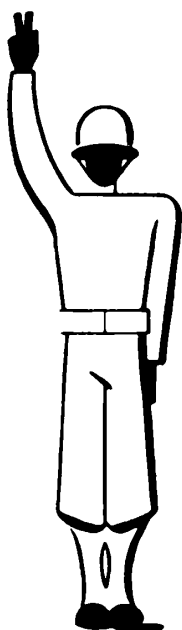
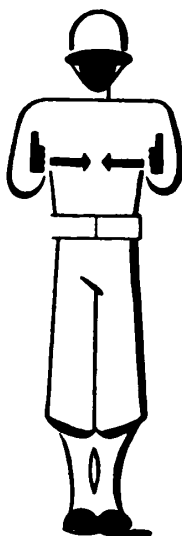


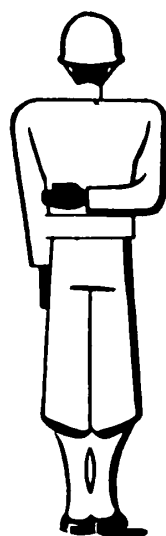
Figure 2. Arm and hand signals.



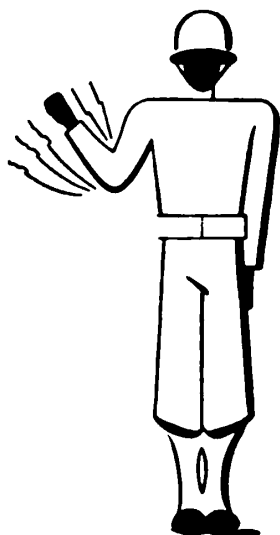
**MOVE IN ___ GEAR — GEAR
INDICATED BY NUMBER OF
FINGERS HELD UP**



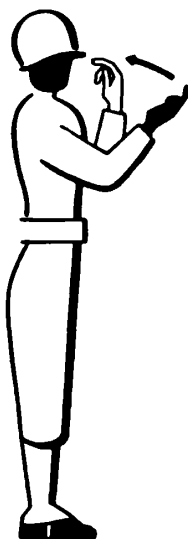
**CLOSE UP — WHEN
HANDS COME TOGETHER
DRIVER STOPS**



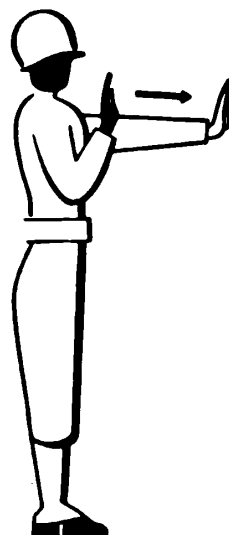
DISREGARD



**CHANGE DIRECTION —
AS LONG AS SIGNAL
IS GIVEN**



MOVE FORWARD



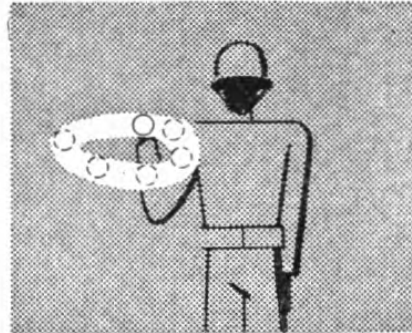
**MOVE IN REVERSE —
ONCE SIGNAL IS GIVEN
DRIVER MOVES UNTIL STOPPED**

Figure 3. Arm and hand signals.

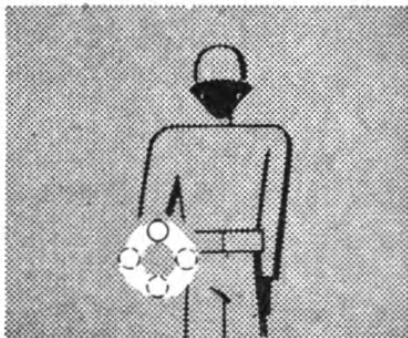
b. If your vehicle goes out of operation on the road pull off the road if possible. One crew member will dismount and direct other vehicles to pass.

LIGHT SIGNALS

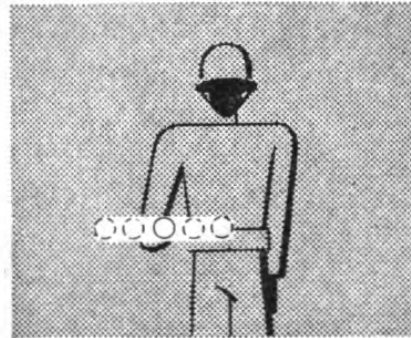
NOTE: AFTER THE MOVEMENT OF A VEHICLE HAS BEEN STARTED, IF A DRIVER CANNOT SEE THE LIGHT HE MUST STOP HIS VEHICLE.



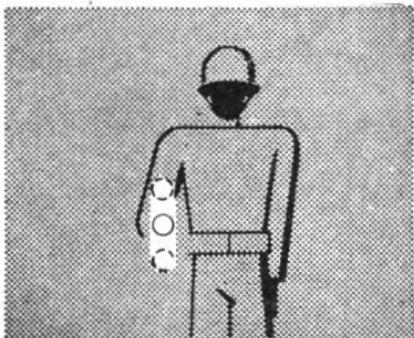
LEFT (RIGHT) TURN



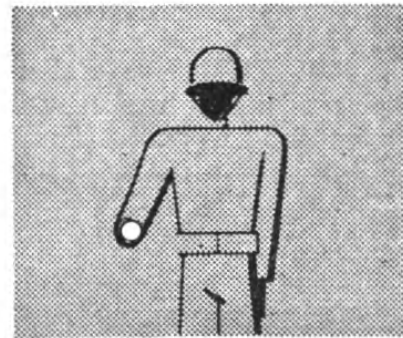
START ENGINES



**STOP MOVEMENT
OR STOP ENGINES**



**FORWARD — MOVE OUT,
GO. INCREASE SPEED.**



MOVE IN REVERSE

Figure 4. Light signals.

FLAG SIGNALS

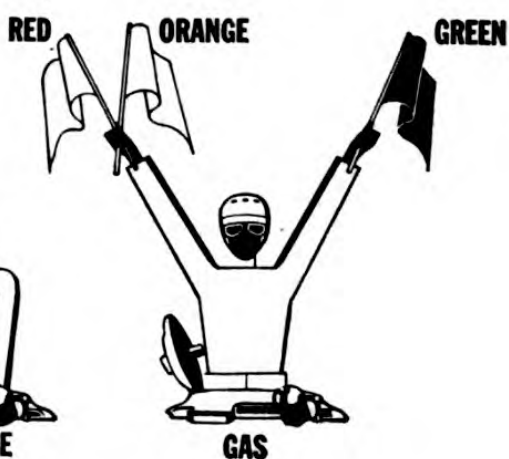


Figure 5. Flag signals.

c. When moving a vehicle into or through a bivouac area, or park, always have a dismounted guide in front.

d. When following a ground guide, keep at least 10 yards behind him, or far enough so that you can stop if he stumbles or falls in front of your vehicle. In wooded areas be careful not to knock trees onto the guide.

e. At night, when following a guide with a light, stop immediately if you cannot see the light.

f. Do not back your vehicle (except upon orders from your vehicle commander) unless you have a guide on the ground who is in a position to see both to the rear and to the direct front.

g. When two or more dismounted guides attempt simultaneously to direct you, halt your vehicle until one guide only assumes this duty.

h. Except when ordered to carry troops, never move your vehicle while anyone is riding on the outside of it.

i. Never smoke in or near a combat vehicle.

j. Always wear a helmet or helmet liner while riding in an armored vehicle.

k. Obey promptly the commands of your vehicle commander.

8. USE OF TRIP TICKET. The purpose of the trip ticket is to establish standard maintenance and driving practices. While the trip-ticket system

may be altered in combat areas, the practice remains in force.

a. The driver usually takes care of the trip ticket and must know how to fill it out properly. You must know how to perform the first echelon maintenance operations and know what to do when you discover something wrong. Be sure operations which the crew is not authorized to correct are noted on the trip ticket and reported to the motor sergeant.

b. See figure 6 for the form of the trip ticket.

9. USE OF DRIVER'S ACCIDENT REPORT. An accident report must be filled out at the scene of an accident. For details see the appendix, TM 21-305.

DRIVER'S TRIP TICKET AND P. M. SERVICE RECORD				U. S. A. No. 3069829	
DRIVER'S NAME J. J. Smith				DATE 10 Aug 45	
REPORT TO Capt. R. A. Jones				TIME OUT 1300	
ORGANIZATION Regtl. Dvr's. Tng. Course				TIME IN 1605	
DEPARTMENT OR ADDRESS 7th Ave. & 4th St. Port					
KIND OF WORK (or route) Dvr. Demonstration					
REQUESTED BY (Organization or individual) Capt. R. A. Jones				T/5 James A. Brown (Dispatcher's signature)	
SPEEDOMETER			HOUR METER		
In	Out	Total Miles	In	Out	Total Hours
1403	1397	6			
FUEL ADDED 5 GALS.	I have performed the "preventive maintenance services" of this form and recorded all deficiencies and any accident. J. J. Smith (Driver's signature)				
OIL ADDED 1 QTS.					
I have noted all entries on this form and taken the necessary action. T/5 James A. Brown (Dispatcher's, etc., signature)					
TRIP OR LOAD RECORD			PASSENGERS OR WEIGHT	SPEEDOMETER OR HOUR METER	
FROM Motor Park				1397	
TO Dvr's. Tng. Course				1398	
TO Dvr. Demonstration			31 tons	1402	
TO Motor Park			4 pass	1403	
TO					
TO					
TO					
TO					
TO					
VEHICLE RELEASED AT (Speedometer-Hour meter, date, hour) 1402 10 Aug. 45 1600					
OFFICIAL USER (Signature and grade) C. L. Grum T/Sgt					

War Department Form 48-Approved 15 December 1944

16-35560-2

① Front.

Figure 6. Driver's trip ticket.

DRIVER'S DAILY PREVENTIVE MAINTENANCE SERVICES

Perform these services according to the instructions in TM 37-2810.
or vehicle operator's manual

BEFORE OPERATION SERVICE

- | | | |
|--|---|---|
| 1. Tampering and damage.
2. Fire extinguishers.
3. Fuel, oil, and water.
4. Accessories and drives.
5. Air brake tanks.
6. Leaks—general.
7. Engine warm-up.
8. Choke or primer.
9. Instruments.
10. Horn and W/S wipers. | 11. Glass and R/V mirrors.
12. Lamps and reflectors.
13. Wheel and flange nuts.
14. Tires and/or tracks.
15. Springs and suspensions.
16. Steering linkage.
17. Fenders and bumpers.
18. Towing connections.
19. Body, load, and tarps.
20. Decontaminator | 21. Tools and equipment.
22. Engine operation.
23. Operator's publications.
24. Amphibian items.
24-1. Mats. handling equip. items.
24-2. Special engineer items.
25. Drying operation check. |
|--|---|---|

OPERATOR'S INITIALS JJS

DURING OPERATION SERVICE

- | | | |
|--|--|--|
| 26. Steering brakes.
27. Foot and hand brakes.
28. Clutch.
29. Transmission.
30. Transfer. | 31. Engine and controls.
32. Instruments.
33. Steering gear.
34. Running gear.
35. Body and trailer. | 36. Guns—mountings, and elevating, traversing, gyro, and firing controls.
37. Amphibian items.
37-1. Mats. handling equip. items.
37-2. Special engineer items. |
|--|--|--|

OPERATOR'S INITIALS JJS

AT HALT SERVICE

- | | | |
|--|--|--|
| 38. Fuel, oil, and water.
39. Temperatures — hubs, brake drums.
40. Axle and transfer vents.
41. Propeller shafts.
42. Springs and suspensions.
43. Steering linkage. | 44. Wheel and flange nuts.
45. Tires and/or tracks.
46. Leaks—general.
47. Accessories and belts.
48. Air cleaners.
49. Fenders and bumpers.
50. Towing connections. | 51. Body, load, and tarps.
52. Appearance and glass.
53. Amphibian items.
53-1. Mats. handling equip. items.
53-2. Special engineer items. |
|--|--|--|

OPERATOR'S INITIALS JJS

AFTER OPERATION SERVICE

- | | | |
|---|--|---|
| 54. *Fuel, oil, and water.
55. Engine operation.
56. Instruments.
57. Horn and W/S wipers.
58. Glass and R/V mirrors.
59. Lamps and reflectors.
60. Fire extinguishers.
61. Decontaminator.
62. *Battery and voltmeter.
63. *Accessories and belts.
64. *Electrical wiring.
65. Air cleaners and breath-er caps.
66. *Fuel filters.
67. Engine controls.
68. *Tires and/or tracks.
69. *Springs and suspensions. | 70. Steering linkage.
71. Propeller shaft, center bearing and vent.
72. Axle and transfer vents.
73. Leaks—general.
74. Gear cases.
75. *Air brake tanks.
76. Fenders and bumpers.
77. *Towing connections.
78. Body, load, and tarps.
79. Armor and front roller.
80. Vision devices.
81. Turret and gun—mount-ings, and elevating, gyro, traversing, and firing controls. | 82. *Tighten—wheel, rim, axle drive flange, and Spring U-bolt nuts.
83. *Lubricate as needed. WDLO NO Date
84. *Clean engine and vehi-cle.
85. *Tools and equipment.
86. *Amphibian items.
87. *Mats. handling equip. items.
88. *Special engineer items. |
|---|--|---|

OPERATOR'S INITIALS JJS

Those items marked by an asterisk () require additional weekly services and it is mandatory that they be performed as prescribed.

Record any accident and all deficiencies indicating if corrected:

Windshield wiper blade missing

R. & D.

16-35560-2 GPO

② Back.

Figure 6. Continued.

CHAPTER 3

PRELIMINARY MECHANICAL TRAINING

10. NOMENCLATURE AND FUNCTIONING. To properly operate and maintain your vehicle, you must know nomenclature, functioning, and first echelon maintenance. To learn this, study the Technical Manual which applies to your vehicle and which is carried in it at all times. If you have any questions after a thorough study of the manual, ask your motor sergeant or motor officer for an explanation.

11. INSTRUMENTS. The instruments are discussed thoroughly in the pertinent Technical Manual. Instrument readings can tell you a great deal about the operation of your engine, but first you must understand their purpose, know what their normal readings are, and know what an abnormal reading indicates. Before driving any vehicle, know what the correct readings of its instruments should be. While driving, look frequently at the instruments. If any reading is abnormal *stop the engine immediately*. Find the trouble and correct it or report it to the maintenance sergeant.

12. CONTROLS. Before you begin to operate your vehicle you must know how to handle all the controls. The Technical Manual for your vehicle tells

you the location and the proper use and handling of the controls, and the checks and maintenance you must accomplish.

13. DRIVER'S INSPECTION AND MAINTENANCE.

Your part in inspections and maintenance is an important one. You have definite checks to make. These checks are set forth in the crew drills which are prepared for each type of vehicle. You must be able to check the lubricants in the major units of the vehicle, and the suspension system. Further, you should be able to check completely the entire vehicle if the other members of the crew are not present.

14. STARTING AND WARMING UP. To make your engine last longer and perform better, you must know the right way to start it and warm it up. The correct method is given in the Technical Manual pertinent to your vehicle.

15. COOLING AND STOPPING. The life and performance of the engine depends, too, on the way it is stopped. The driver must cool the engine and shut it off in a way that will prevent damage. See the pertinent Technical Manual for full information.

16. PREVENTION OF VEHICLE ABUSE. To prevent abuse, you must understand the capabilities and limitations of your vehicle. It is an intricate

mechanism that will perform magnificently if driven correctly and given proper maintenance. If you abuse it, all the maintenance experts in the Army cannot keep it in good condition.

b. Common practices that shorten the life and retard the performance of your vehicle are:

(1) Reckless driving not only tears up valuable equipment but also makes dust and noise that reveal your position.

(2) Operating the vehicle or racing the engine, without proper warm-up, causes unnecessary wear because an oil film has not been built up to lubricate the metal-to-metal contact. This causes wear and scoring of cylinders, rings, and bearings.

(3) Failure to idle your engine before stopping it allows different parts to cool off at different rates. After completing a run, the engine must be operated at idling speed for 2 to 5 minutes to assure gradual and uniform cooling of the valves and other engine parts.

(4) Running at the smallest allowable number of revolutions per minute while pulling a load puts a strain on the working parts, and thereby greatly shortens the life of an engine.

(5) Shifting to a lower gear is accomplished only when you are sure your vehicle speed is below the fastest allowable speed for the gear into which you are shifting; otherwise, the engine,

clutch, and power train units are put under excessive strain.

(6) Riding and slipping the clutch causes excessive damage to throw-out bearings and clutch plates.

(7) Jerking the vehicle by incorrect shifting places undue strain on the engine and power train.

(8) Striking trees or other objects with the sprocket or idlers is extremely harmful to the track and suspension system.

(9) When a radial engine sits overnight, oil may drain into the lower cylinders. Before starting the engine, turn the handcrank at least 50 revolutions. If it turns with unusual difficulty, indicating a hydrostatic lock, take out the lower spark plugs and drain the oil from the bottom cylinders.

(10) Running your vehicle with low oil pressure or high engine temperature will ruin your engine. If the oil pressure is low, or the temperature high, *stop the engine immediately.*

CHAPTER 4

TERRAIN

Section I. GENERAL

17. TERRAIN EVALUATION. a. After your preliminary mechanical training, you study all types of terrain, and learn to select the most suitable routes. As you study the terrain, you think, observe, and ask yourself these questions:

(1) Where are the covered routes of approach? How can I best use the folds in the ground, the trees, the buildings?

(2) Where are the probable locations of enemy defenses? Where are the reverse slopes, the narrow ravines, the ridge lines? How am I going to cope with them?

(3) Are there any slopes, ditches, streams, or obstacles that my vehicle is unable to negotiate? Considering the flotation of my vehicle, are there any stretches of soft ground I must avoid?

(4) What is the relationship in this area between vegetation and open terrain? Do I see any types of grass or brush that are peculiar to swamps and bogs?

(5) What are the weather conditions, and what are the future predictions? How would rain, snow, sleet, or sun affect the terrain at which I am now looking?

b. Figures 7 through 25 illustrate some of the characteristics of varied terrain.



Figure 7. Dark patches of ground usually mean poorly drained places where your tracks may mire. Dark gray or bluish soil is usually muck which cannot be crossed by full-track vehicles.

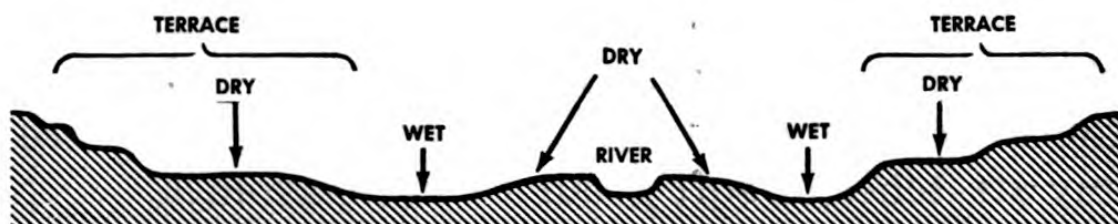


Figure 8. This is a typical cross section of a river valley in fairly level ground. If the banks of the river are planted with such crops as wheat, cotton, or corn there will usually be good traction. The best ground for driving is normally next to the river or on the first terrace, the middle area being soft and mucky. When driving across or near streams, stay on coarse sand or gravel. Avoid any spot that looks like finer grained soil or that is cracked on the surface. Such spots are usually fine silt that can mire your vehicle.

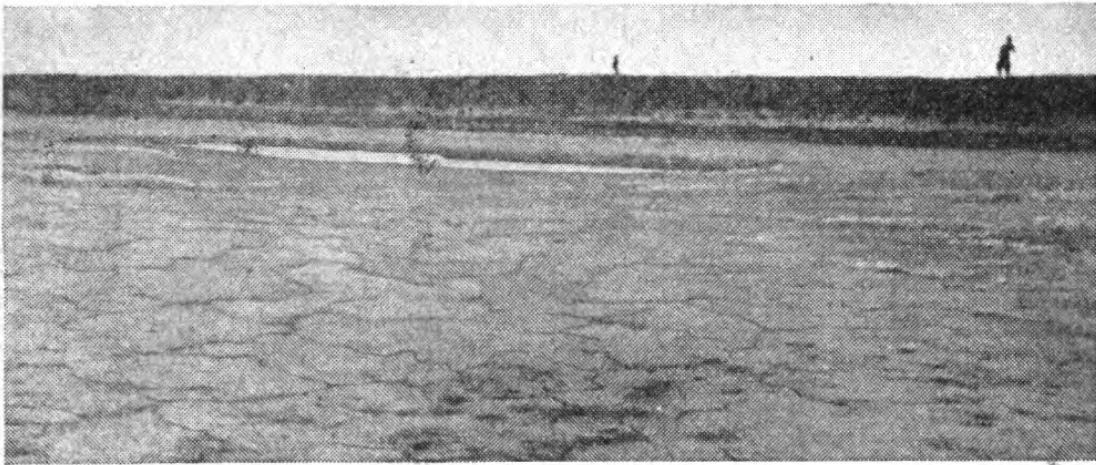


Figure 9. This type of mud flat terrain is typical of some coastal areas and intermittent lake regions. In dry weather these flats may be passable for tracks. Choose light colored soil. Keep away from dark spots. Do not follow in the tracks of vehicles in front of you. •

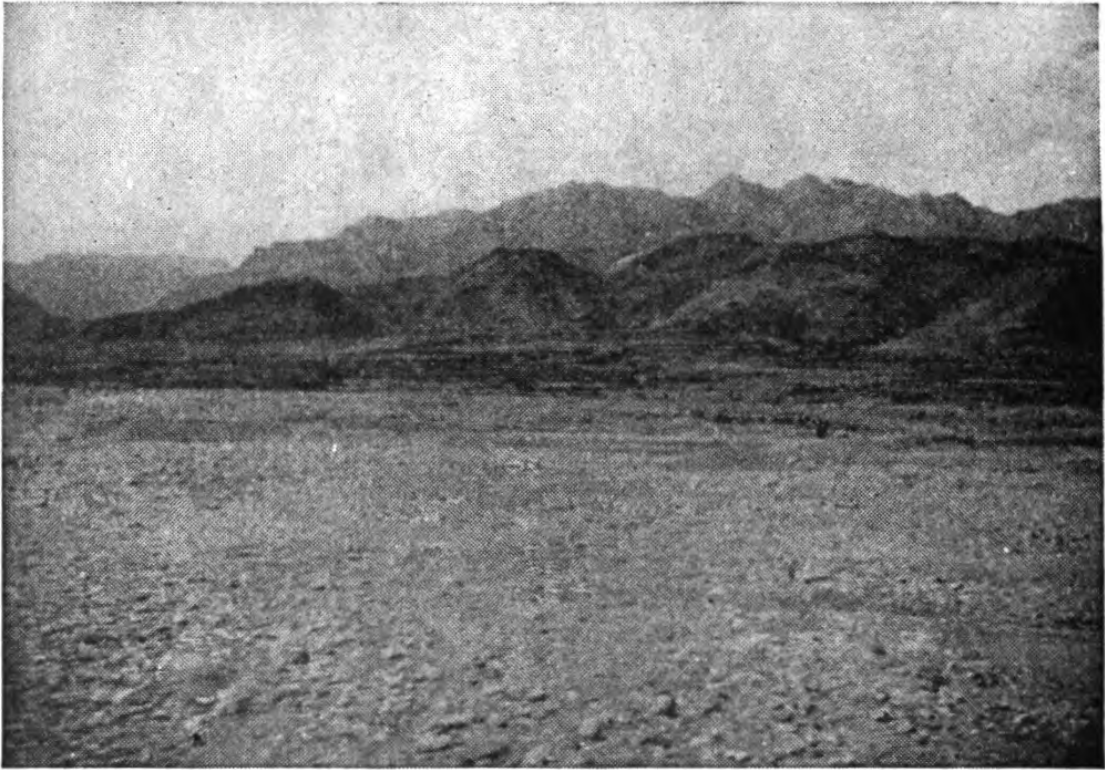


Figure 10. Coarse sand and gravel is usually suitable ground for full-track vehicles. However, there may be small spots which are poorly drained, and which might cause the vehicle to bog down. Look for and avoid: darker ground; bowl shaped depressions; finely grained soil.

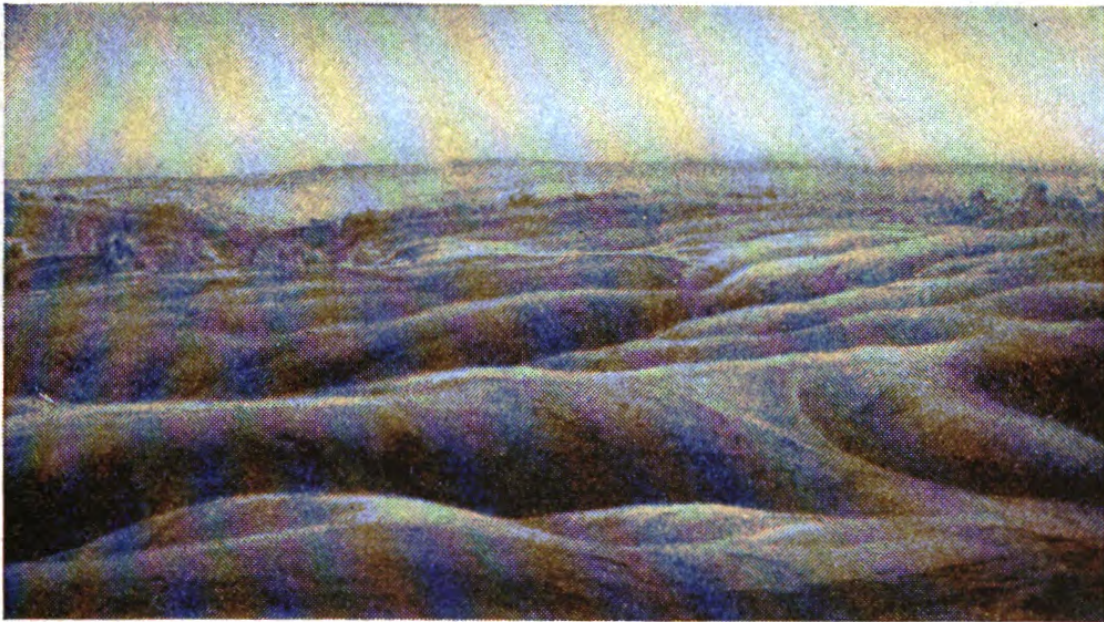


Figure 11. This is an example of eroded clay soil. In dry weather, it gives good traction; in wet weather, it is slippery. Do not belly your vehicle on the narrow ridges; or, in wet weather, slip off into one of the deep gullies. The best route is along the wider high places.

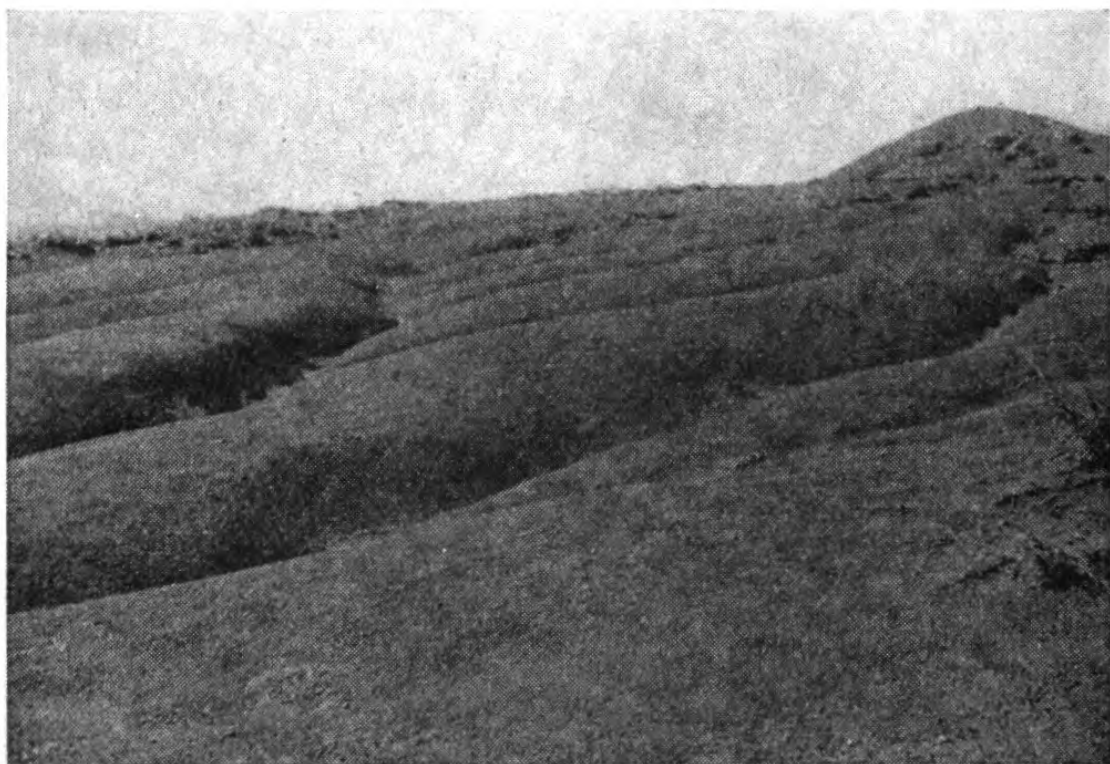


Figure 12. Gently sloping terrain with scattered patches of vegetation provides good traction for track vehicles. It may be slippery when wet. Stay away from deep gullies.

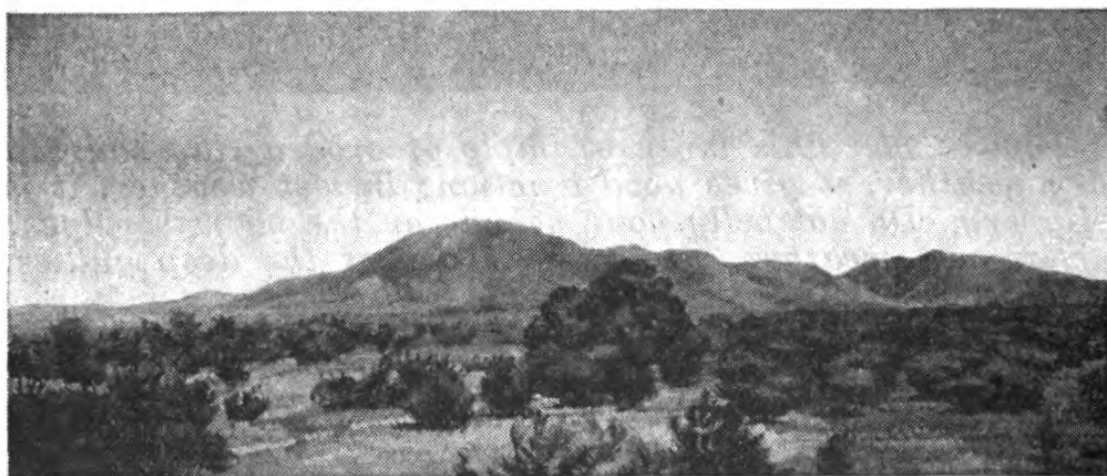


Figure 13. Scattered clumps of small trees with grassland between indicate good terrain for full track vehicles. Avoid patches of grass which are deeper in color and coarser in texture than the surrounding grass; they grow in poorly drained areas where your vehicle may bog down.

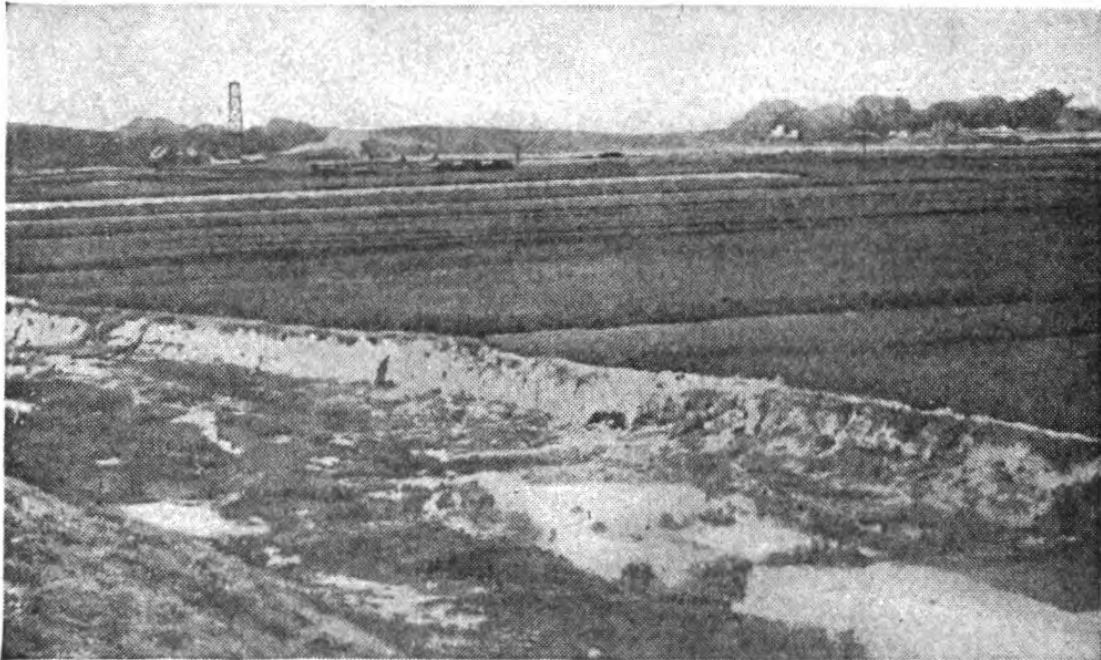


Figure 14. Crops are usually a fair indication of the traction the terrain will afford. These fields are planted with peanuts and beans, both of which need fairly well-drained soil. Except in irrigated areas, where ditches will be an obstacle, crossing such fields should be easy.



Figure 15. Cotton is grown usually on well-drained soil. This type of field can be crossed easily except in extremely wet weather.

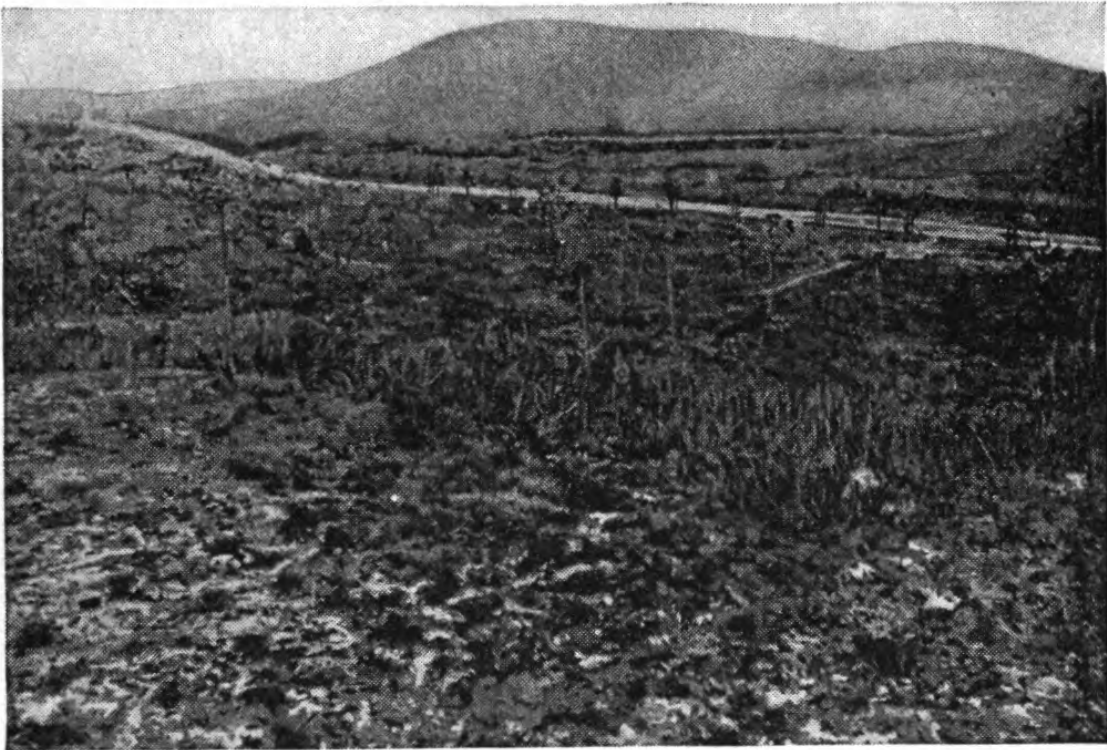


Figure 16. Gravel soil, sparse vegetation, scattered trees, and sloping land mean good ground for track vehicles.



Figure 17. This grassland, covered with scattered trees, is good full-track vehicle country. Stay on the slopes. Avoid low ground where the grass is coarser in texture and darker in color than the surrounding area.



Figure 18. These scrub pines are an indication of good ground for track vehicles.



Figure 19. Young sugar cane fields, where the cane is not over 6 feet high, can usually be crossed with track laying vehicles. It is hard to see while crossing the field. You must be especially careful not to run into irrigation ditches or other obstacles.

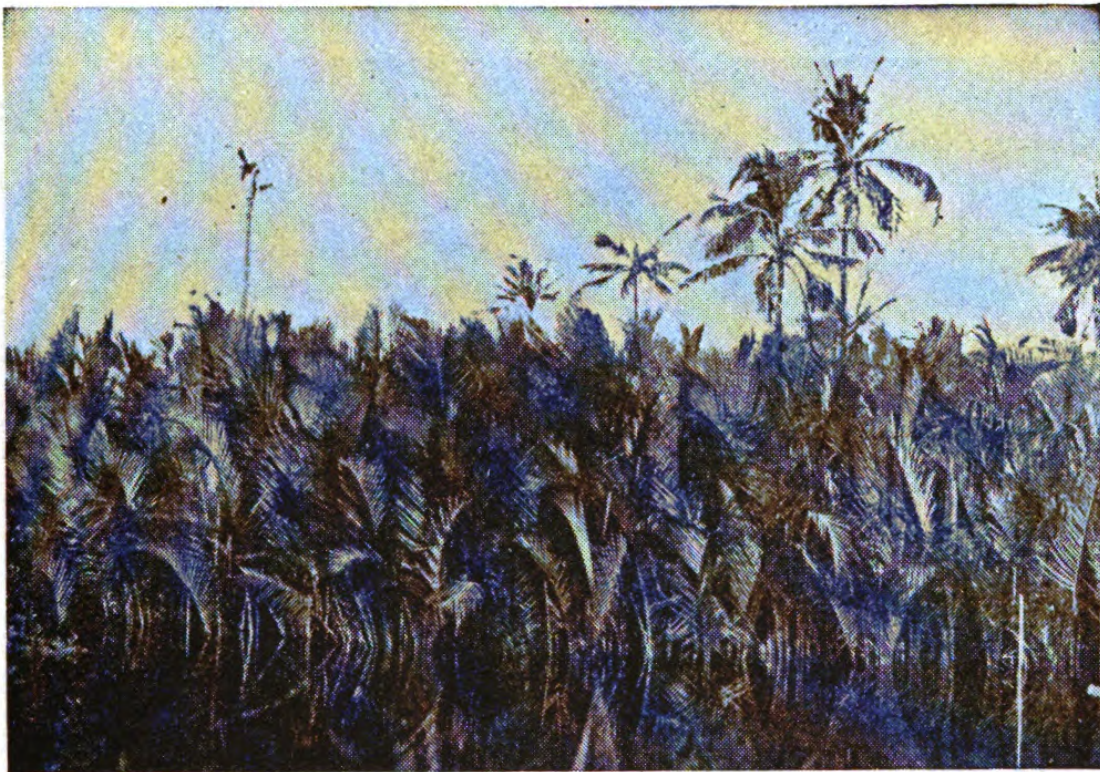


Figure 20. Nipa palms usually grow in swampy, poorly drained areas that are very difficult to cross with a full-track vehicle.



Figure 21. This is a typical view of a rice paddy at planting time. The paddies have a firm bottom with about 10 inches of mud on top. They can usually be crossed in full-track vehicles if the dikes between the fields are not too high, or if they have been leveled with a dozer, and if the deeper and wider irrigation ditches are bridged.

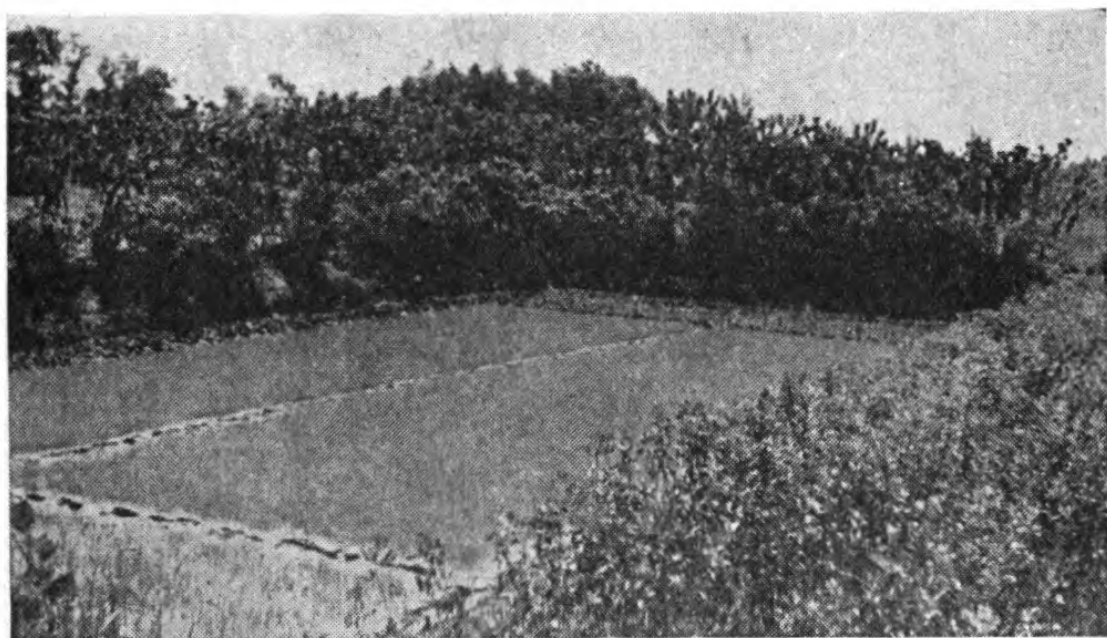


Figure 22. This is a pit about 6 to 8 feet deep, used for growing rice; trees are often planted around the edge. These pits must be avoided. This same type of pit may be found in rice paddies where it is used as a reservoir for holding water. When crossing a paddy that has been planted, stay away from any spot where the rice does not show above the water. It may be one of these pits.



Figure 23. Mangrove trees always grow in very swampy, muddy areas that are impassible for full-track vehicles.



Figure 24. Sweet potatoes are usually grown on sandy well-drained soil. These fields can be crossed easily by tracked vehicles except in very wet weather.



Figure 25. Rice paddies are often located alongside fields of dry crops such as cotton, peanuts, wheat, and corn. When crossing this type of country, stay in the fields planted in dry crops.

Section II. FLAT TERRAIN DRIVING

18. GENERAL. When you have mastered the steps covered so far, you are ready to start driving. This does not mean that you can immediately drive cross country over all types of terrain. You must start on level ground at slow speeds. You must practice flat terrain driving until you get the feel of your vehicle and learn the proper use of the controls.

19. PROCEDURE. Your Technical Manual, which is carried in the vehicle at all times, tells exactly how to move the vehicle forward and backward, and how to shift gears.

20. ENGINE SPEED, SHIFTING, AND TURNING. Here are general instructions which will help you in this first phase of driving.

a. Keep your engine speed within the right range. Never overload your engine.

b. When learning to shift down, guide yourself as follows:

(1) If you want to shift from third to second, drive the vehicle in third gear at just below the fastest speed allowable in second gear, and listen to the sound the engine makes at this speed. (Practice until you can come to this speed by listening to the engine and without looking at the speedometer.)

(2) Then, driving in third gear at just under the fastest allowable speed for second gear, shift into second gear.

c. When making a turn with a full-track vehicle, press slightly on the accelerator. This keeps up your speed and prevents overloading the engine.

Section III. ROUGH TERRAIN DRIVING

21. JUDGMENT. In this phase of driving, you are called upon to use judgment, as well as to manipulate the controls properly. You learn how to cross simple obstacles and how to judge distances. You drive your vehicle over bridges and through stalls that are very little wider than your vehicle. Even

when inside the vehicle, you must know the exact location of your tracks. Knowing this, you will drive confidently over bridges, down narrow alleys, through rubble-filled streets, and between the trees of heavy forests. Nothing can be written that will take the place of learning by doing. Driving skill is gained through experience and practice.

22. PROCEDURE. a. Before starting up a hill, choose a gear or range that will carry you all the way up and over the hill.

b. When planning to use the engine as a brake while going down hill, always shift down before starting the descent. Hold your vehicle to the correct speed with the steering brakes. Never try to shift after you have started down a hill.

c. While going up a hill, steer as little as possible. Turning left or right takes more power than going straight ahead.

Section IV. DRIVING ON ALL TYPES OF TERRAIN

23. GENERAL. a. In this phase of driver training you progress to more difficult driving. You drive cross country, over rough terrain, negotiating ditches, vertical or near-vertical banks, obstacles, mud, and sand. You practice formation driving over all types of terrain, driving buttoned up under all conditions, and at night. In this phase you must use sound judgment in choosing the right

gear and speed; in using your brakes, clutch, and accelerator; and in deciding whether to cross an obstacle, or to select another route. If you are driving a combat vehicle and the gun projects beyond the front slope plate, its added length must be considered in all driving calculations. To avoid ramming the muzzle of the gun in the ground when crossing ditches, notify the gunner of all oncoming ditches so that he can elevate the gun beforehand.

b. The right way of crossing different kinds of terrain and obstacles are illustrated in figures 26 to 35 inclusive.

Note. The procedures illustrated apply to vehicles with hydramatic and torqmatic transmissions as well as to those with a synchro-mesh transmission.

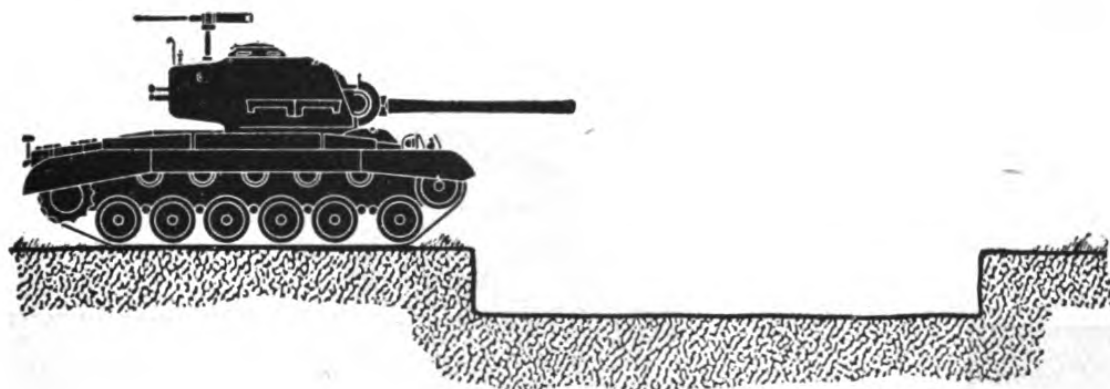


Figure 26. As you approach a ditch, slow down and shift into a lower gear.

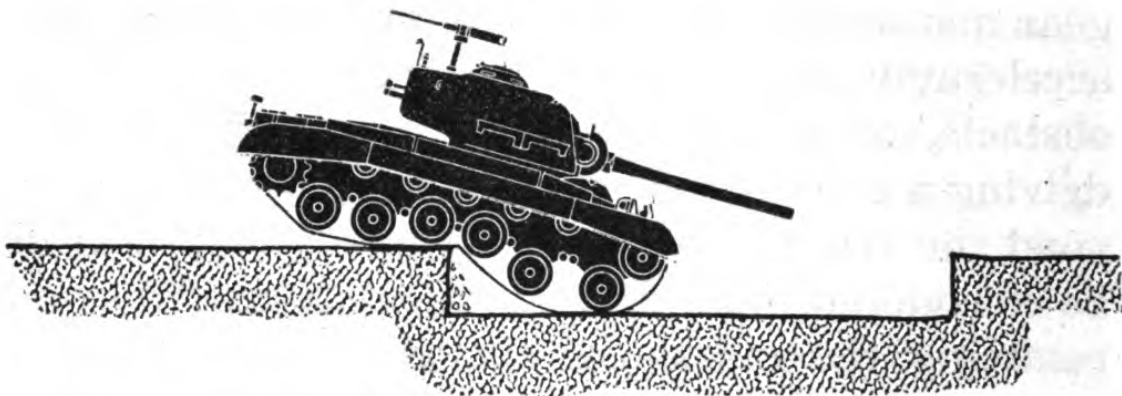


Figure 27. As the vehicle noses over, depress the clutch and apply the brakes. This allows the vehicle to ease into the ditch.

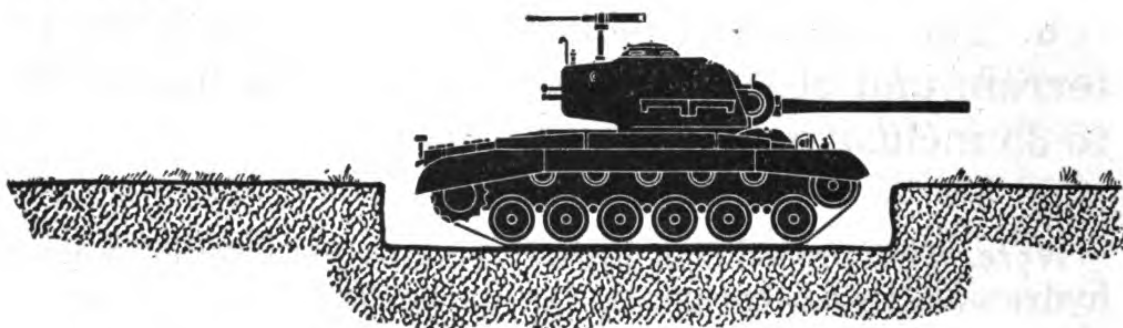


Figure 28. After the vehicle settles in the ditch, release the brakes, engage the clutch, and at the same time, depress the accelerator enough to carry the vehicle up the other side of the ditch.



Figure 29. Just as the vehicle starts to balance over the edge of the ditch, depress the clutch pedal and at the same time, let up on the accelerator.

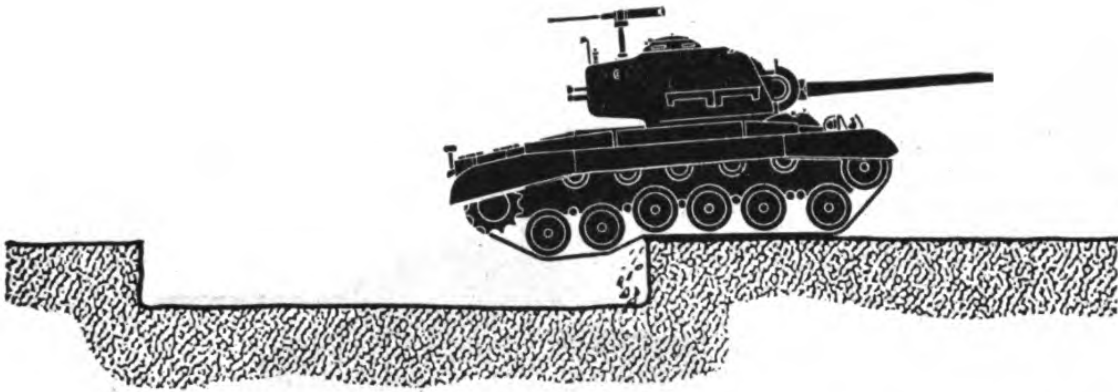


Figure 30. Just before the nose of the vehicle hits the ground, release the clutch pedal and at the same time, depress the accelerator.



Figure 31. Shift down to second or first gear as you approach an obstacle. The choice of gear will depend upon the height of the obstacle.



Figure 32. Keep your engine RPM up while climbing the obstacle.

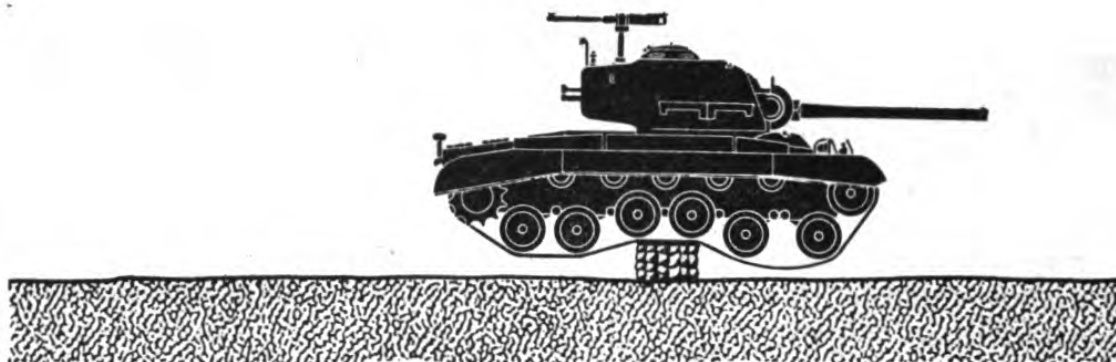


Figure 33. Just as you reach the balance point of your vehicle, and it starts to break over, depress the clutch pedal and at the same time, let up on the accelerator.

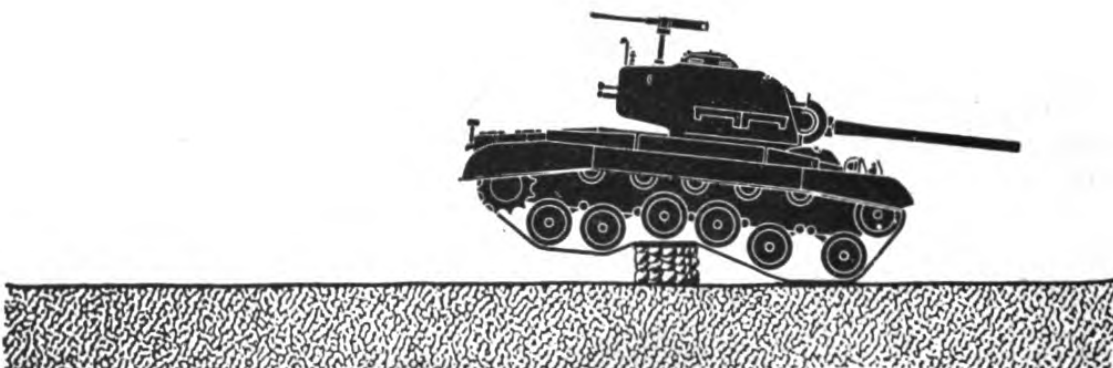


Figure 34. Just before the front of the vehicle hits the ground, release the clutch pedal and at the same time, depress the accelerator and drive smoothly away.



Figure 35. This is a 31° slope. Do not attempt to ascend or descend a slope steeper than this.

24. DRIVING ALONG A HILLSIDE. a. Whenever possible, avoid driving along the side of a hill.

b. When you must drive along the side of a hill, try to keep power flowing to the tracks at all times. This will help to prevent throwing a track.

c. Avoid boulders, stumps, ruts, and uneven ground.

25. DRIVING IN MUD OR SAND. a. If you can keep your tracks moving and keep your vehicle from bellying down, you will usually get through mud or sand.

b. If you feel one track starting to spin, pull back on the steering lever on that side to throw power to the other track.

c. Shift into a low gear before starting through

mud or sand, unless the distance across the difficult spot is short enough that you can hit it hard and let momentum carry you through.

d. If you have to stop or shift after entering the mud or sand, you will usually be stuck—so keep it rolling.

26. DRIVING THROUGH WOODS AND BRUSH. a. If you cannot avoid hitting a tree, hit it with the center of the vehicle, not with the sprocket or idler.

b. Remember that the rear of a track laying vehicle swings in the opposite direction to the way you turn. Do not turn too quickly after passing a tree, as this may swing the rear into the tree and damage an idler.

c. Never back-track through woods in which you have pushed down trees. The trunks and limbs will point toward you like so many spears. They may injure your crew, or cause the vehicle to become stuck.

d. In driving through high brush or grass, watch for gullies, ditches, boulders, and stumps. If you keep a careful watch, you can determine indications of such obstacles.

27. FORDING A STREAM. Have a dismounted man reconnoiter to determine depth, type of bottom, and the best approach and exit.

28. NIGHT VISION AND NIGHT DRIVING. Some men

are able to see better in the dark than others; however, any man can improve his night vision by applying these simple rules:

a. To dark-adapt your eyes, stay away from light or cover your eyes in the presence of light for at least 30 minutes before starting on a night march. This is an important step in night vision. If you are not completely dark-adapted, you endanger yourself and others during black-out operations. Adaptation must be guarded once it is attained. Even the flare of a match reduces the effectiveness of the eyes for at least $\frac{1}{2}$ hour. When unexpected light occurs, close or cover one eye; or if possible, look completely away from the light source. If a light is used to read a map, use a dim flashlight with a red lens. Red light has the least damaging effect on dark adaptation.

b. **Employ off-center vision.** Look about 3° to the right, to the left, above, or below the object or trail you wish to see, and you can pick up the object out of the "corner of your eye." If you look directly at an object at night, it falls into the blind spot of your eye, and you do not see it.

c. At night, you see more and suffer less from eye fatigue if you scan your field of vision with short, jerky movements. In addition to the greater likelihood of finding the target when you scan the field, there is another important reason for not staring fixedly at an object at night. If you stare

long at a black-out light, or any bright spot, the object soon appears to move. This illusion often causes accidents. For example, a driver following a truck in convoy by staring at its tail light may be led to make turns by following the apparent turns of the light, although the truck ahead actually is moving in a straight line. The only way to be sure that this apparent movement does not cover is to follow the rule, don't stare—scan!

CHAPTER 5

TANK DRIVING UNDER WINTER CONDITIONS

29. GENERAL. If winter conditions are not anticipated and prepared for, they may have disastrous effects on both men and machines. FM 70-15 describes these effects, and sets forth methods of "winterization." This chapter does not cover these details. It is concerned with how you, the driver, will handle your vehicle under winter conditions.

30. GENERAL WINTER DRIVING PRINCIPLES AND TECHNIQUES. **a. Skidding.** (1) *How to minimize the possibility of skidding.* (a) On an iced surface, drive at a speed that will keep your vehicle responsive to the controls at all times. Descend grades and turn corners in low gear, at the slowest possible speed.

(b) You cannot always choose your route of march but when there is a choice avoid icy hills. Rolling ground is best negotiated by cross-country routes, which, in most cases, afford tracks a better gripping surface than hard, slick roadways.

(c) The type of track on a vehicle has a great influence over its behavior on icy surfaces. Steel tracks, although excellent in snow and mud, are poor performers on ice. This disadvantage can be overcome, at least partially, by welding small spikes or cleats to the surface of the track shoe.

Rubber tracks are more advantageous on ice than steel tracks. The reversible rubber track block can be improved greatly by attaching grousers to the tracks at equal intervals with not more than 10 grousers to each track. Too many grousers nullify the advantage, as their gripping ability is dependent upon high pressure forcing the few grousers to bite into the icy surface.

(2) *How to handle a skid.* If your vehicle begins to skid, do this: leave your clutch engaged, keep your feet off the gas, and get the vehicle under control by a *gradual pressure on both steering brakes*. A timely acceleration when the vehicle is pointed in the right direction, though sliding sideways, will reduce the skid.

b. Deep snow drifts. Deep snow drifts are formidable obstacles to even the most powerful full-track vehicle. Experiments and reports of combat operations indicate that 3 feet of snow is the greatest depth that full-track vehicles can negotiate. Deeper drifts have been penetrated by running into them at high speed, but this is foolhardy, as there is no way of telling what the drifts conceal. Continuous operation in deep snow results in the packing of snow in front of and under the vehicle. This will eventually belly the vehicle and the tracks will turn without effect.

c. Ice crossings. Crossing frozen bodies of water with heavy equipment is always dangerous. It is unlikely that the individual vehicle commander or driver will make the decision to cross streams or lakes; however, it will be of value to set down the factors governing such a decision. These are: tactical considerations, characteristics of the crossing approaches and exits, and the thickness and condition of the ice. The crossing approaches and exits must be chosen carefully. Both the near and far banks must be gently sloping down to the edge of the ice. A near bank that is too steep causes vehicular impact to break the ice and a far bank that is too steep prevents the vehicle from leaving the ice. Once the crossing point has been chosen, samples of the ice are cut at 30-yard intervals in a row 10 yards to one side of the proposed crossing lane. These samples are measured for thickness and examined for quality. Only clear ice is a reliable carrier. It will be found often that the clear ice, because of successive thaws and freezes, is laminated with opaque, milky ice. This is "rotten" ice, it is porous, soft, and has no predictable carrying ability. Therefore, only the thickest single layer of clear ice in any one sample is taken into consideration. The following table may be used as a guide to determine the load capacity of ice.

Load capacity of ice surfaces

Type of load	Thickness of sound ice (inch)	Minimum march interval (feet)
Single soldier w/arms	1 ½	16
¼-ton truck 4 x 4	6	49
2½-ton truck w/light load	10	82
20-ton vehicle	16	131
46-ton vehicles	24	164

Note. A part of the supporting capacity of ice is dependent on the water pressure below it. When the water level falls, the load capacity of the ice decreases.

(1) *Crossing procedure.* (a) All crew members, except driver, dismount and precede or closely follow the vehicle on foot. All hatches remain open.

(b) The driver follows the vehicle commander, who is responsible that the correct interval from the preceding vehicle is maintained.

(c) Do not halt, turn, or pass while on the ice.

(d) Keep a lookout for cracks in the ice at the crossing site.

(2) *Cracking ice.* Thin cracks oblique to the crossing are not dangerous, but large cracks parallel to the crossing are a sign of reduced carrying capacity. When these are discovered the ice is cleared of vehicles and personnel without delay. Vehicles still waiting to cross find a new crossing place.

(3) *Reinforcement of ice surfaces.* Doubtful ice is made safer for vehicular crossings by laying

15-foot saplings, corduroy fashion, along the route of crossing. Then snow is packed on the saplings and water poured over the whole. After the wet snow freezes, the crossing is ready for use. This procedure distributes the weight over a greater area and provides better traction.

31. CHARACTERISTICS OF DIFFERENT TEMPERATURE RANGES. **a. Thaw (40° to 32° F.).** During thawing weather, when the temperature varies from freezing at night to 40° F. or higher at noon, driving is hazardous. Roads have a tendency to ice over at night and shaded areas may remain iced during the following day. Mud makes its appearance during the thaw period in the spring, and heavy traffic tends to become more and more road-bound as the thaw progresses. Ice crossings are never attempted during a thaw.

b. Moderate cold (32° to 0° F.). At this temperature bracket, mud becomes solidified, and traffic is not limited to the roads. Bogs and swamps can frequently support heavy vehicles. Ice crossings still remain doubtful. Proposed ice crossings are tested thoroughly before use.

c. Extreme cold (0° to -40° F.). At these temperatures the snow is usually dry and powdery. Wind causes the snow to drift. Ice crossings are safe if extreme cold has continued for several days; however, cautious testing must continue.

COLD WEATHER HINTS

Don't:

1. Park vehicle on wet snow or muddy ground during freezing weather. The vehicle tracks will freeze to the ground.

2. "Break out," under its own power, a vehicle that is frozen to the ground. Something will break.

3. Touch the vehicle with your bare hands. Your skin will freeze to the metal.

4. Fail to clean the inside of your vehicle and remove the water and mud which have frozen under the clutch and accelerator pedals.

Do:

1. Park on well-drained gravel, brush, railroad ties, or cardboard from ration cartons so that the tracks do not freeze to the ground.

2. Try towing a vehicle frozen to the ground. Failing in this, use picks and shovels.

3. Wear gloves. If it is necessary to use tools with your bare hands, first, heat the tools on the exhaust pipe.

4. Always mop out snow, water, and mud before they freeze. Chip out any ice that forms.

Don't:

5. Fail to cover your vehicle with the tarpaulin when you get a freezing rain, sleet, or snow.

6. Leave mud, snow, and ice on suspension system after operation.

Do:

5. Keep vehicle covered when possible. Remove all excess grease and oil. Give special attention to machine gun mounts, periscope mounts, other tight fitting movable parts. Use a light oil and wipe almost dry.

6. Clean mud, snow, and ice off entire suspension system before allowing vehicle to stand over night. Check to see if support rollers are free before start of operation.

CHAPTER 6

FIELD EXPEDIENTS

32. GENERAL. Field expedients are based on a common sense use of the things you have in the field with which to do a job. A few minutes of thought before starting the work often save hours of unnecessary labor.

33. CONTROLLED DIFFERENTIAL. A number of field expedients for full-track vehicles are based on the way the controlled differential works. If your vehicle has thrown or broken one track, you can move the vehicle by holding back on the steering lever on the same side. This throws power over to the side that has the track and your vehicle moves either forward or in reverse. However, if you do not hold back on this steering lever, the vehicle stands still because the power is thrown to the sprocket which is free to turn without the track. Paragraphs 34 through 38 describe several of the most common field expedients.

34. ONE TRACK SPINNING. To move a full-track vehicle which has one track on solid ground and the other spinning in the mud, pull back on the steering lever on the same side as the spinning track. This throws power to the track on solid ground and your vehicle moves out. (See fig. 36.)

To move the vehicle in a straight line pull back alternately on the levers.

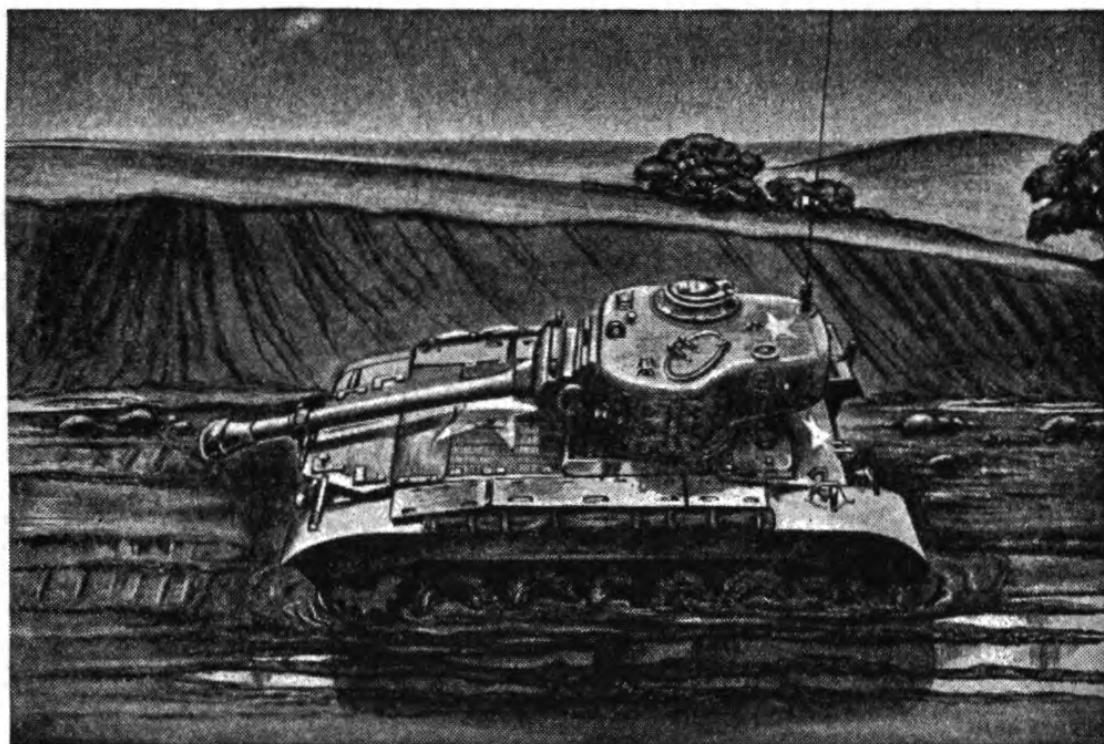


Figure 36. When in mud and only one track spins, move the vehicle by holding back on the steering lever on the same side as the spinning track.

35. SLIPPERY HILL. a. To move a full-track vehicle up a slippery hill or incline (fig. 37)–

- (1) Attach one end of the cable to a track.
- (2) Attach the other end to a tree or dead man.
- (3) Hold back on the steering lever on the side opposite to the anchored track and move the vehicle forward until the end of the cable passes the rear bogie wheel.
- (4) Disconnect the cable and, if the vehicle still

cannot gain traction, repeat the procedure.

b. If both tracks are slipping, two evenly spread cables are used. Do not pull back on either steering lever except to keep the cables centered on the tracks.

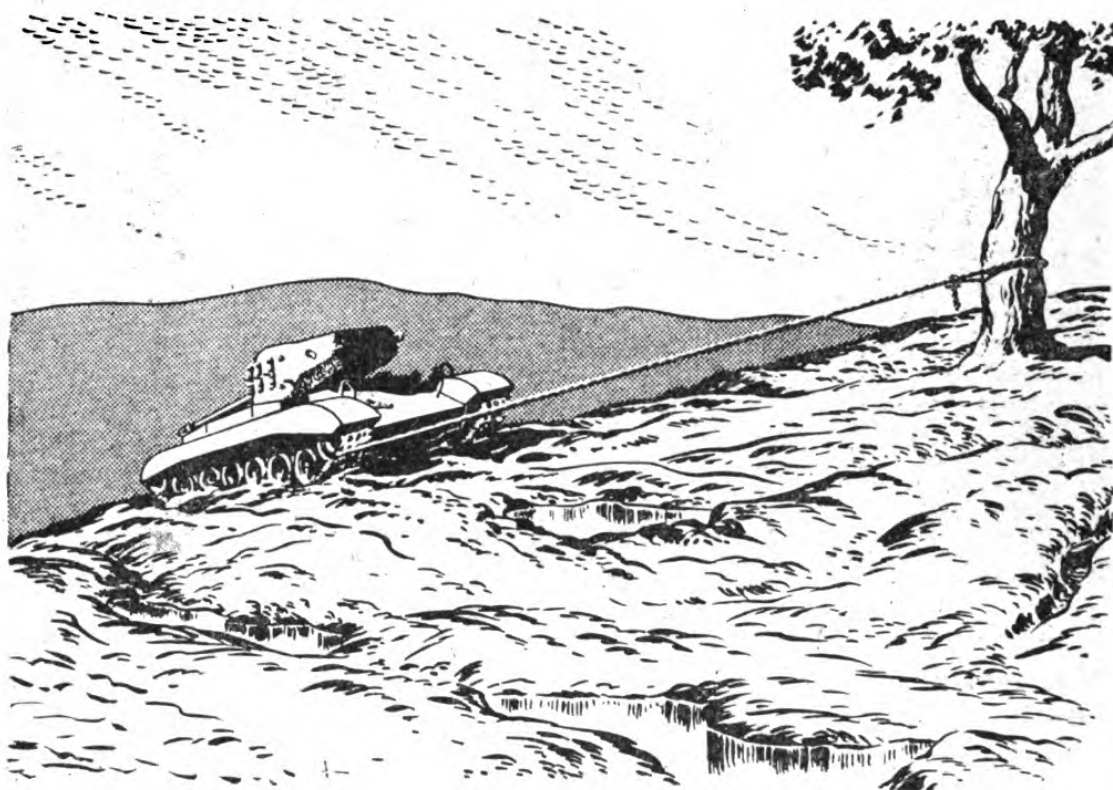


Figure 37. Move the vehicle up a slippery hill by anchoring one track with a cable and holding back on the opposite steering lever.

36. THROWN TRACKS. To move a full-track vehicle when one or both tracks are off, use one sprocket as a winch. (See fig. 38.)

a. Attach the cable to the sprocket on the side with the thrown track so that it will wind up when the sprocket turns.

b. Attach the other end of the cable to an anchor.

c. Hold back on the steering lever on the side opposite the cable and move the vehicle forward.

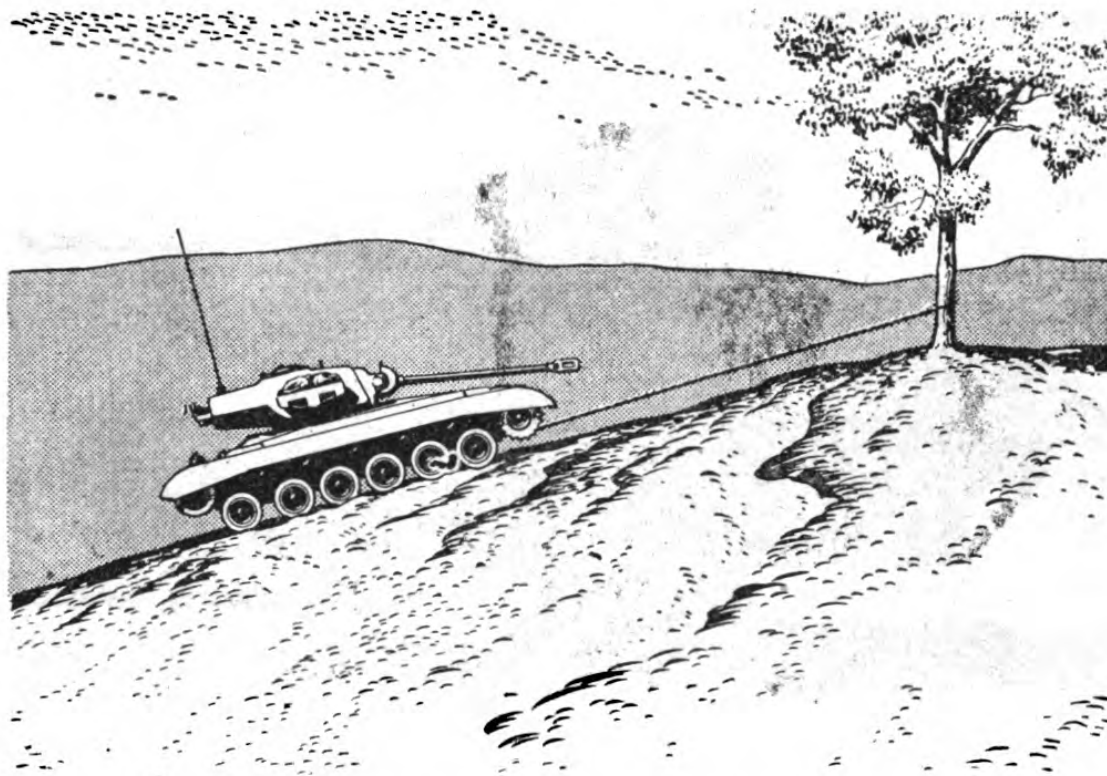


Figure 38. When one or both tracks are thrown, move the vehicle by using the sprocket as a winch.

37. BELLIED VEHICLE. To remove a vehicle bellied on a stump or in mud, chain a log to the tracks. (See fig. 39.)

a. Cut a log that is at least 12 inches in diameter.

b. Lay the log in front of the tracks.

c. Attach each end of the log to a track.

d. By use of the engine, move the tracks to the

rear so that the log will strike the stump, or, if the vehicle is bellied in mud, so that it will lift the vehicle up and move it forward.

e. When the log passes the rear bogie wheels, unchain it and, if the vehicle is still bellied down, repeat the procedure.

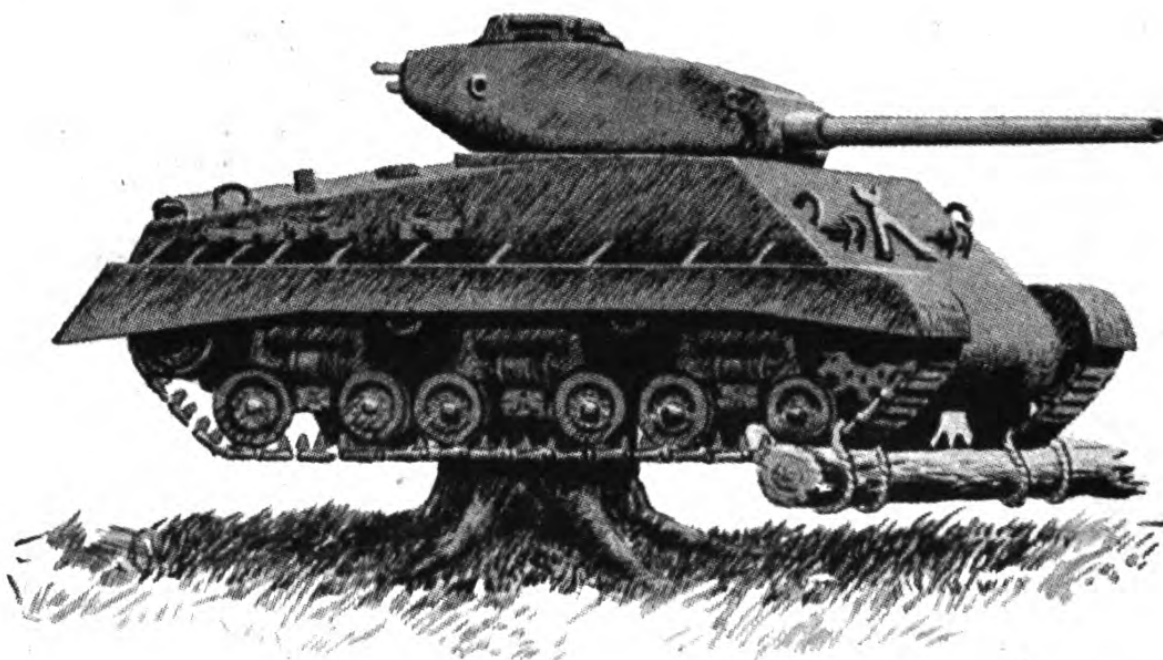


Figure 39. A vehicle bellied on a stump can be moved by chaining a log between the tracks.

38. BROKEN OR BLOWN BOGIE. To chain up a bogie wheel that is broken or has a blown tire—

a. Drive the vehicle up on a log to raise the damaged wheel.

b. Pass a chain or rope through the wheel and the track skids. Tie or hook.

c. Back the vehicle off the log and drive away.

CHAPTER 7

COMBAT DRIVING

39. MISSION. To become a good combat driver you must remember that your first mission is to drive your vehicle so that the gunner can bring effective fire upon the enemy. To do this you must understand the disadvantages of cant and the importance of selecting a place where the gun trunnions are as nearly level as possible. At the same time you must drive so that your vehicle is the least affected by the enemy's guns, antitank obstacles, and mines. You must know how to move into defilade position without unnecessarily exposing the vehicle. You must be able to employ cover and concealment while moving. You must at all times be alert to prevent surprise.

40. USE OF COVER AND CONCEALMENT. Knowing how to make good use of available cover and concealment is just as important to the combat vehicle driver as to the infantryman. It is impossible to put enough armor on a vehicle to stop penetration by *all* AT weapons. Therefore, you must select routes and positions that give cover and concealment from enemy observation and fire. There is little terrain in the world so flat and bare that there is no concealment or cover to be found. You must learn to see and use every fold in the

ground and every bit of possible cover within your area or zone. Figures 40 through 50 illustrate the proper use of cover and concealment.

41. POSITIONS. Normally, the vehicle commander points out the general location of a firing position into which he wants you to move. This does not mean that you cannot suggest a better firing position in the area than the one he may select. Figures 51 through 56 illustrate the principles of selecting and moving into a firing position.

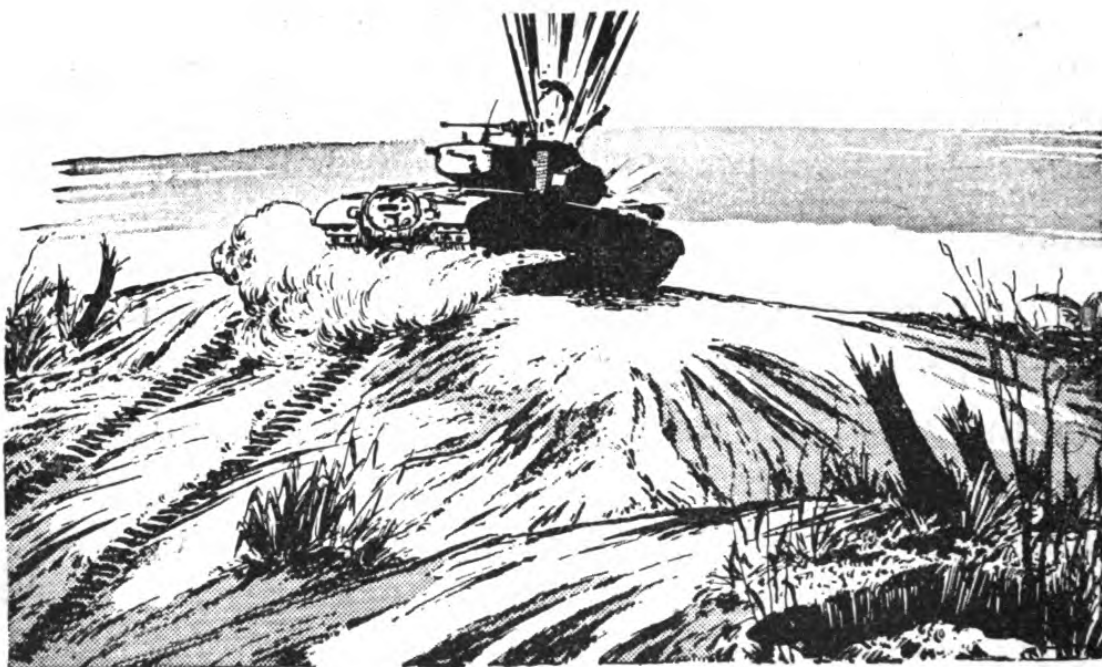


Figure 40. Keep off the skyline.



Figure 41. Use the folds in the ground. A slight rise can give enough cover.



Figure 42. Dust gives your position away.

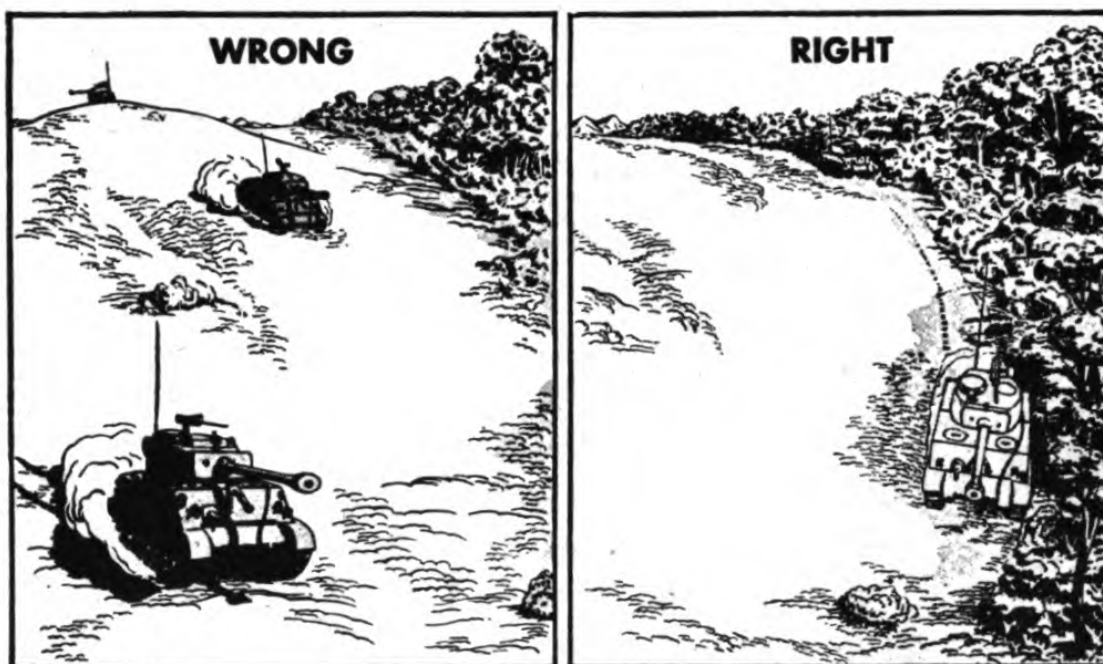


Figure 43. Avoid a light background. Use a dark background.

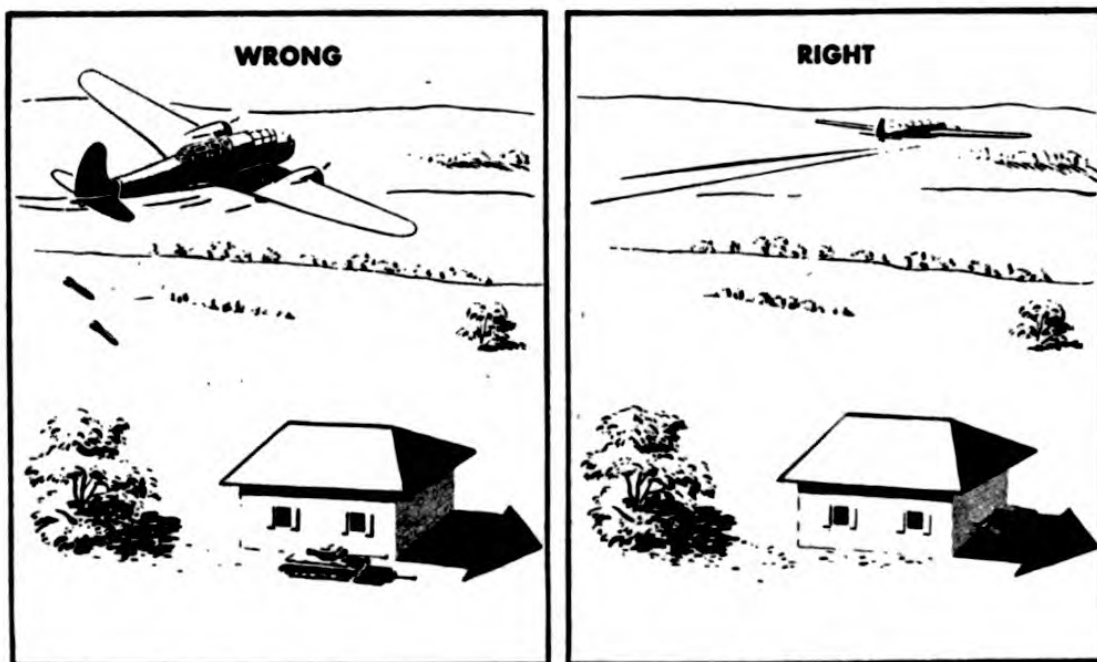


Figure 44. Do not unnecessarily expose yourself. Use shade or shadows. Move with the sun.



Figure 45. Even thin brush may give fairly good concealment.

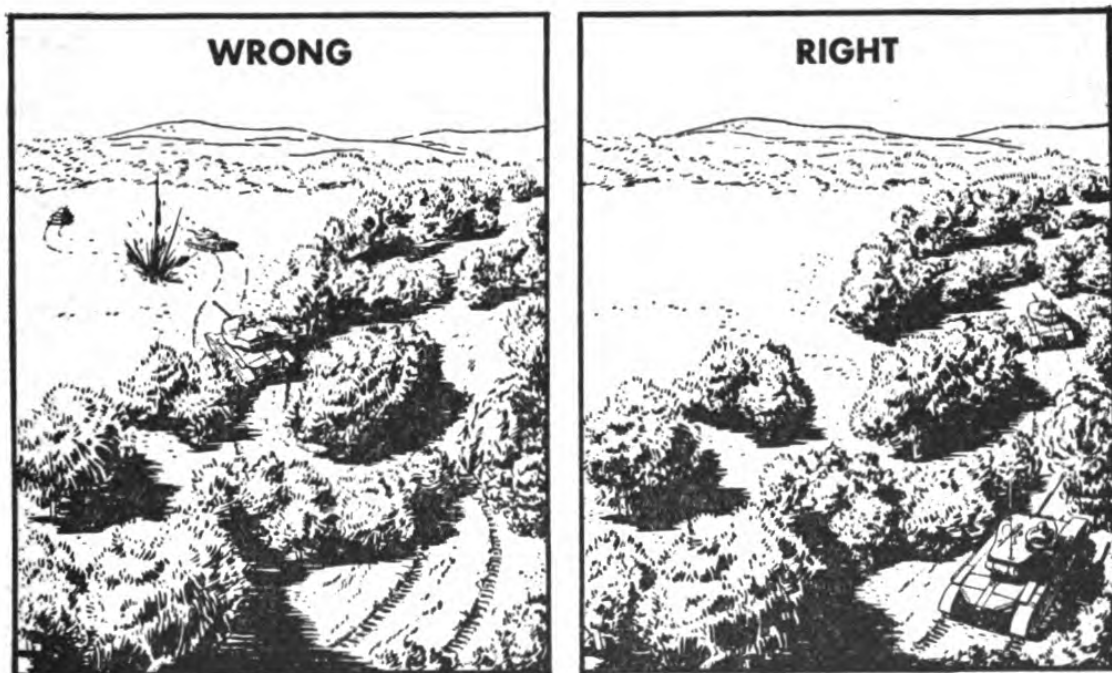


Figure 46. Do not take a short cut across open fields. Use all available cover, such as hedgerows, trees, and woods.

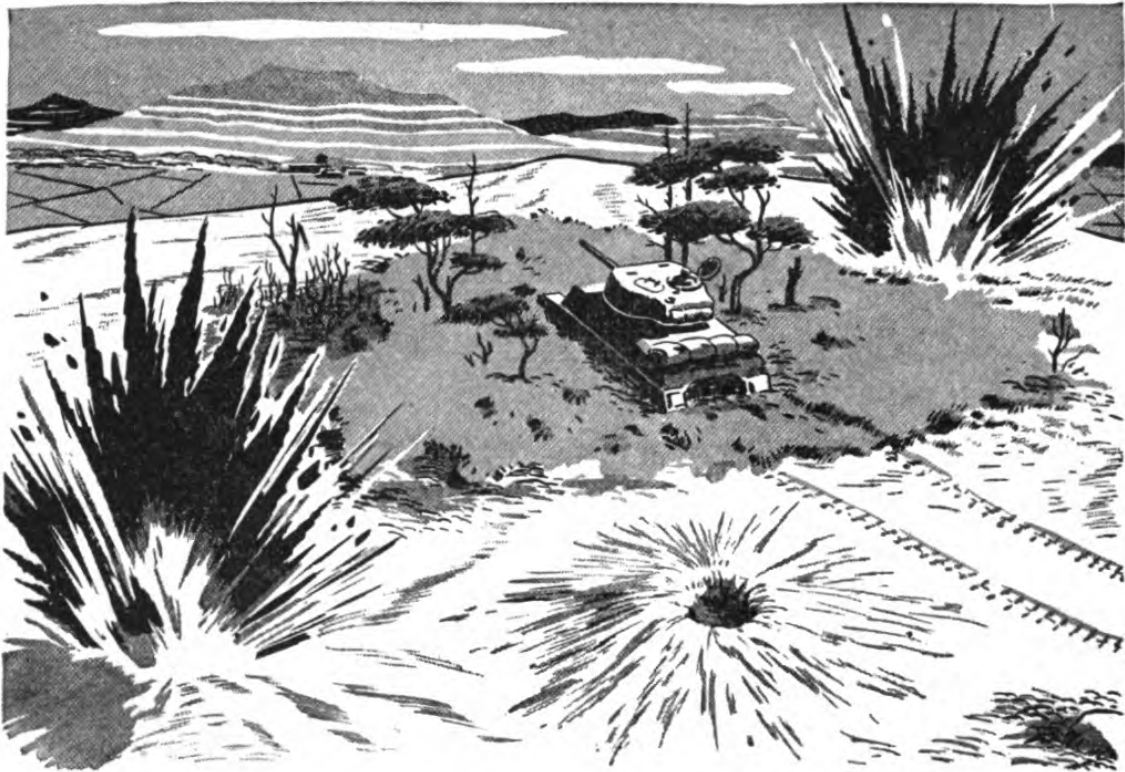


Figure 47. Do not use as concealment, lone trees, clumps of brush, or other obvious terrain features. Enemy anti-tank and artillery guns frequently register on these.



Figure 48. When it is necessary to cross a ridge, the moving element crosses in line formation supported by other tanks in firing position. This formation gives greater fire power against enemy weapons which might otherwise concentrate fire on a single tank.

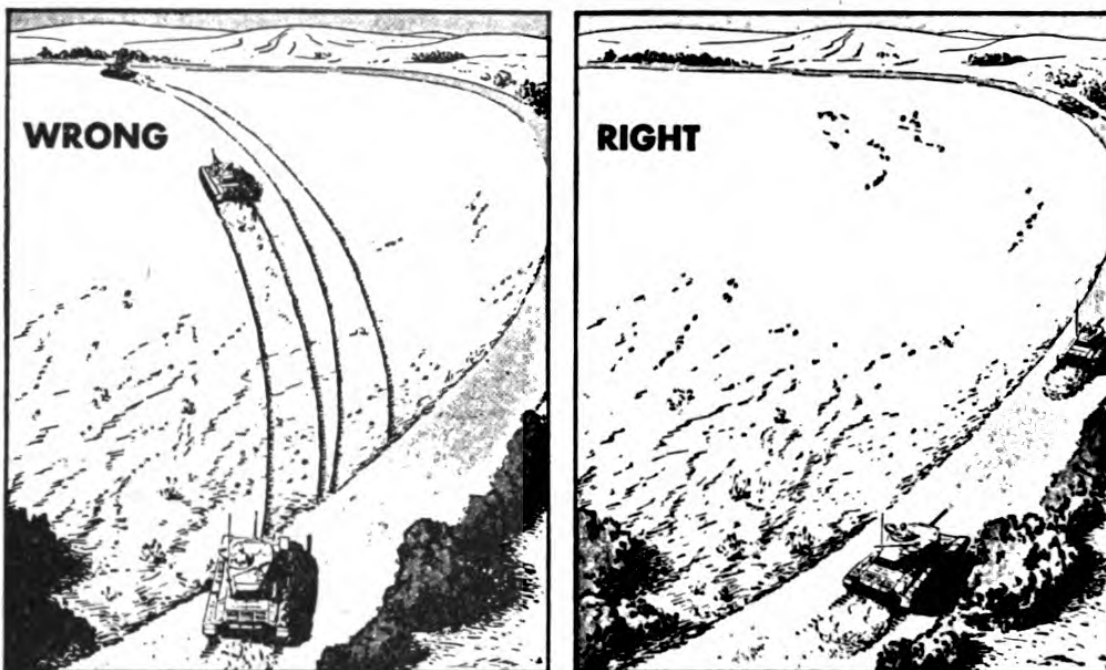


Figure 49. Avoid unnecessary short cuts which leave tell-tale tracks.

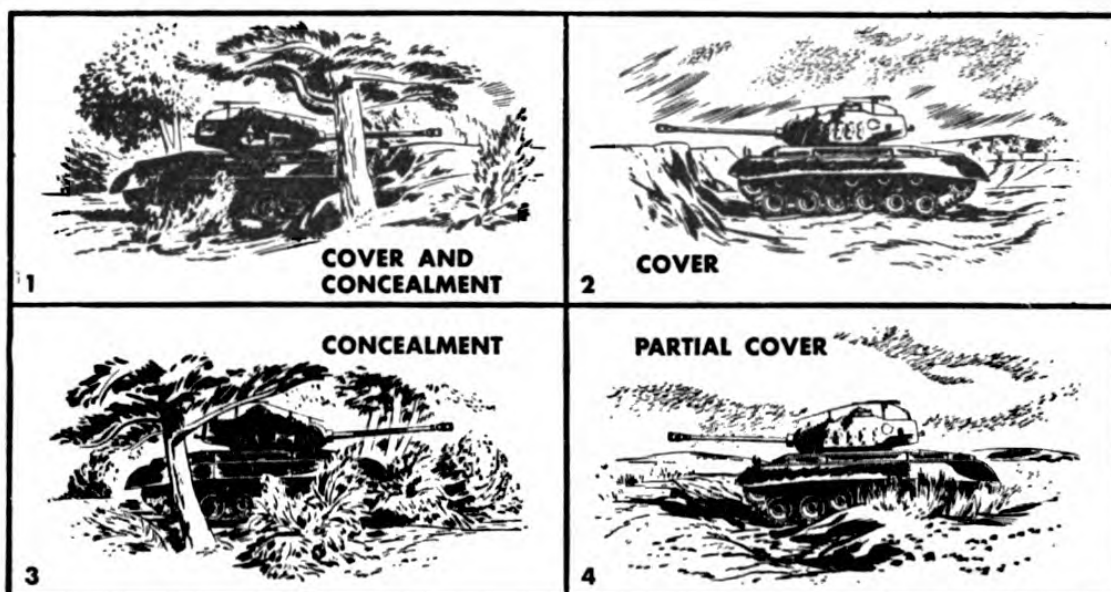


Figure 50. When possible, select a firing position that gives both cover and concealment. These illustrations show the usual order of desirability.

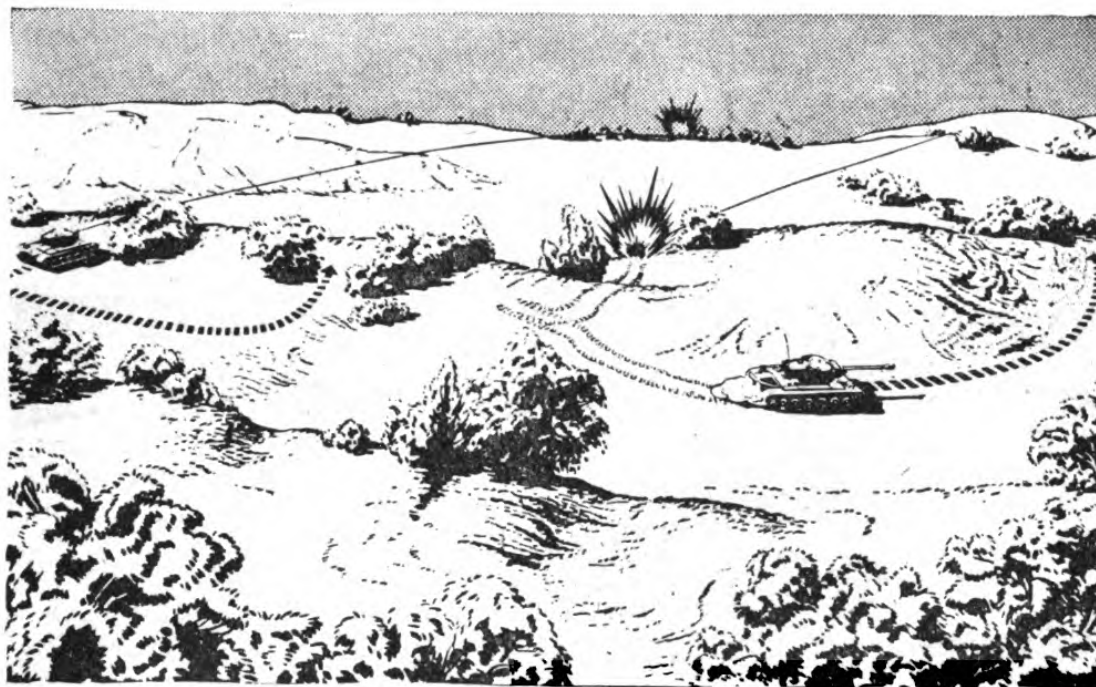


Figure 51. Always select an alternate position and a route to this position so that you can move quickly if fired upon.

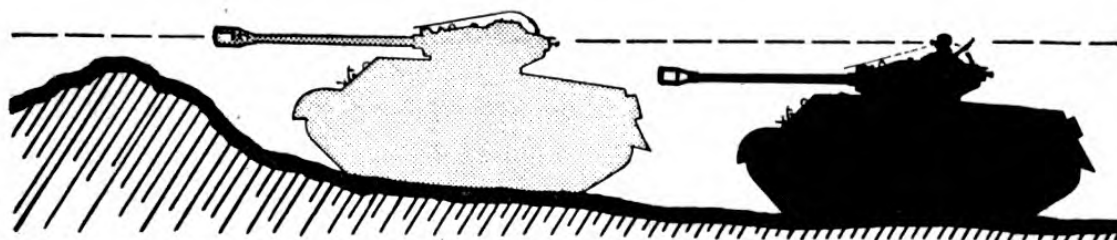


Figure 52. When moving into a defilade position, move up so the vehicle commander can look over the crest. Then, on order of the commander, ease up until the gun clears the mask (hull defilade).



Figure 53. Do not rush haphazardly into position. It is better to move slowly but surely. Learn to judge from the driver's seat when your vehicle is in defilade.

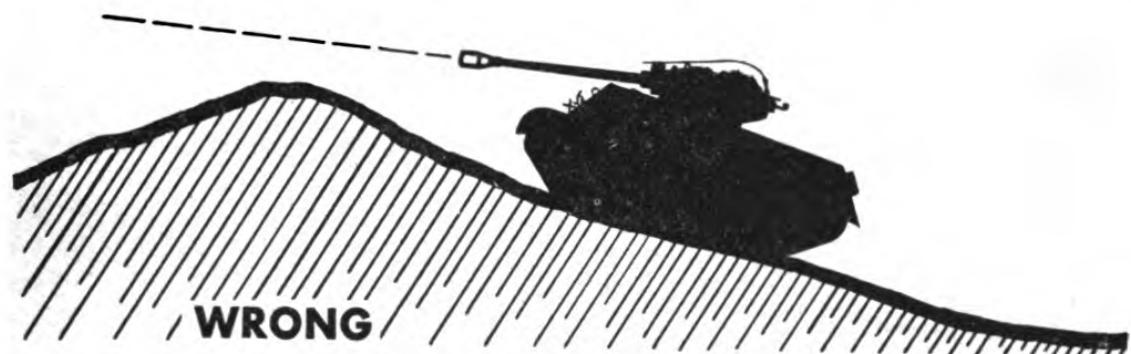
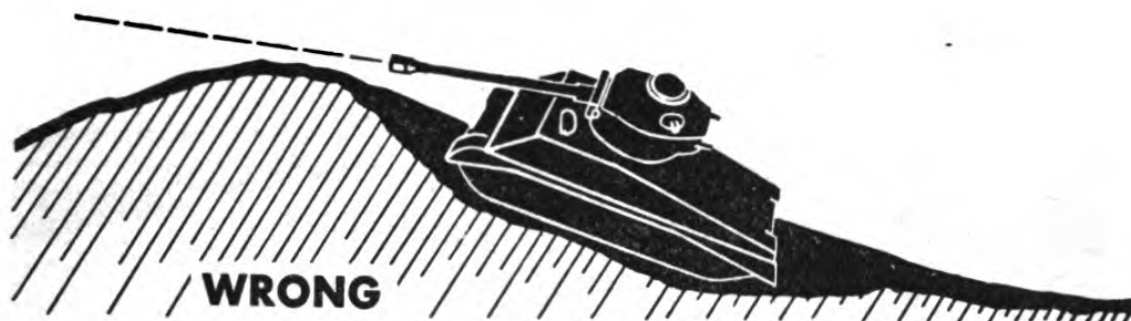


Figure 54. Select a level position where the gun can be depressed enough to sight on the target. Do not place the vehicle at too much cant, or at such an angle that the gun cannot be depressed sufficiently to hit the target.

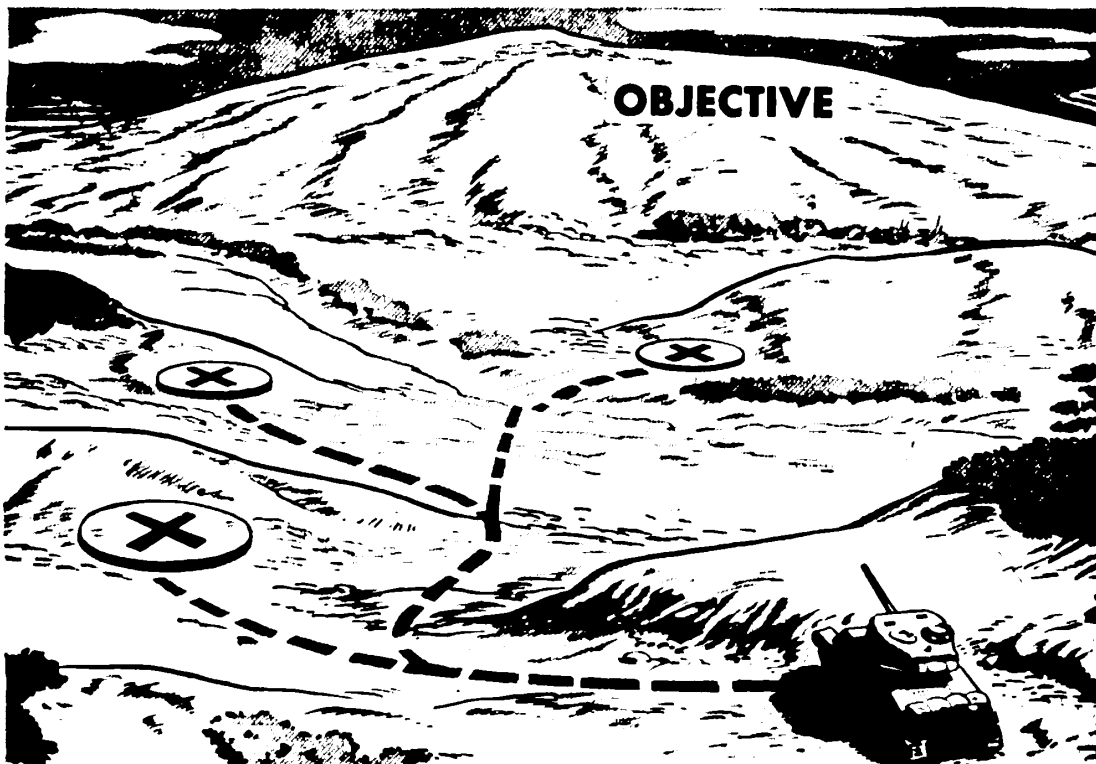
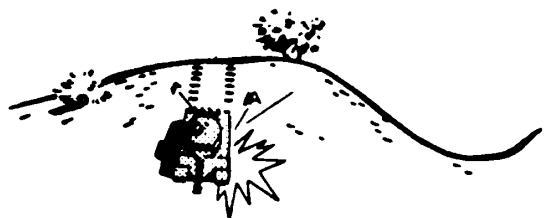


Figure 55. Select, if possible, several intermediate defilade positions into which you can move quickly if you draw heavy antitank fire before reaching your objective.

WRONG



RIGHT



Figure 56. Select your route as far forward as possible before you start to move. Do not cross a hill from the position in which you are firing. Move back behind the crest and cross at a point where the enemy is not expecting you.

42. MINES. Antitank mines are a constant danger. They are placed easily and quickly ; and, although they do not always destroy the vehicle, they can, by blowing off a track and parts of the suspension system, put your vehicle out of action. You must learn to recognize likely mine field sites and avoid them. Be particularly watchful at the following places :

- a. Defiles.
- b. Approaches to bridges.
- c. Fords.
- d. Bypasses around bridges that have been blown.
- e. Road blocks.
- f. Crossroads.
- g. Turnouts around craters.
- h. Shoulders of steep curves on narrow portions of a road.
- i. Old ruts.
- j. Gun positions.
- k. Likely bivouac areas.
- l. In front of infantry positions.
- m. Fortifications.

43. PROVEN PRACTICES. One of the best ways to learn combat driving is to study the experiences of others. Figures 57 through 60 illustrate some of the practices that have enabled other drivers to win victories with minimum losses.

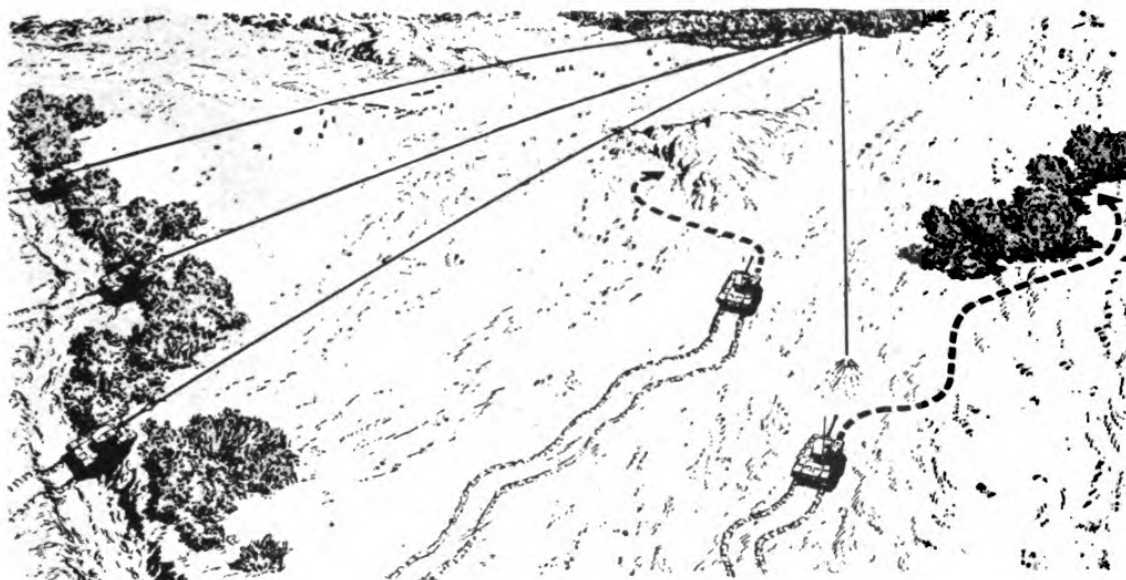


Figure 57. When fired upon by enemy antitank guns while in the open, do not stop. Use your speed to get under cover. Take a zigzag course. Vary your speed to make it hard for the antitank guns to track you.



Figure 58. When fighting against enemy infantry armed with antitank weapons, keep alert. Swing your vehicle in the direction of the nearest antitank gunner. This places your heaviest armor toward the weapon, and gives you a chance to spray him with machine-gun fire or with the flame thrower.



Figure 59. When supported closely by infantry, drive in a low gear or range to keep from running away from the infantry and also to prevent overheating the engine.



*Figure 60. Do not attempt to crash through barriers.
They will usually be mined.*

CHAPTER 8

FINAL REMINDERS

44. NECESSARY HABITS. The final objective of all driver training is to make a good combat driver. You have to think of many things at the same time. You must select terrain that provides cover from enemy fire. You must keep in formation. While you are thinking of all these things, you must drive your vehicle so that you do not cause unnecessary mechanical wear or damage. To be able to cope with all of your duties, your driving practices must be completely automatic.

45. SITUATIONS. All combat driving is made up of a series of driver "situations." These may be met one at a time, or in various combinations. Typical "situations" are:

- a. Climbing and descending hills.
- b. Steering to take curves or avoid obstacles.
- c. Going through mud, sand, or loose dirt.
- d. Driving on ice or snow-covered terrain.
- e. Going over near-vertical obstacles such as banks, lips of shell craters, and logs.
- f. Fording streams.

46. STEPS IN DRIVING. You know how to meet these incidents from previous instruction. The steps you go through for each situation are the same—seeing, judging, and manipulating.

a. Seeing. There is more to seeing than is readily apparent. Two drivers look at an obstacle. One sees that it is impassible; the other does not. The first goes around the obstacle and continues the battle, the latter tries to go through, becomes stuck, and the vehicle, if not the crew, is lost. You must always look with a "driver's eye" and be able to evaluate the terrain in one quick glance.

b. (1) Judging means deciding what manipulation is needed. When you meet with an accident, you must answer the following questions:

(a) Can it be negotiated, or must I select another route?

(b) What gear should I select?

(c) When should I shift?

(2) To answer these questions, you must use judgment. Good judgment is developed by knowing the characteristics and limitations of your vehicle. You must constantly practice judgment so that it, too, becomes a habit. When you get stuck because of poor judgment, go back over the "incident" and find out just where you failed, so that you will not make the same mistake again. Practice most on that type of "incident" where your judgment is weakest.

c. Manipulation. Manipulation means handling the controls. If you see and judge correctly, and still you cannot operate the controls to make your

vehicle do what your judgment demands, you accomplish nothing. You must be so proficient in handling the controls that you do, without thinking, whatever your judgment tells you should be done. If a slight check in vehicle speed is called for, your feet should automatically let up on the accelerator. You will not have time to stop and think, "To slow the vehicle down, I must let up on the accelerator and apply the brakes."

47. SMOOTHNESS. If you master the arts of seeing, judging, and manipulating, you will be a smooth driver. Smoothness is a sure sign of a good driver. Jerkiness is a sign of a poor one. To demonstrate the effects of jerky operation, tie a piece of string to a 3-pound weight. If you jerk on the string, the weight will not lift; instead, the string will break. If you lift smoothly, the weight will be raised from the ground. The same thing applies to the operation of a vehicle. Smoothness of operation causes no mechanical failures. Jerky operation means a series of break-downs.

48. PRACTICE. There is only one way to become more skillful, and that is through practice. Reduce each operation to a few essential principles. Think about them until they become part of you. Then apply these principles to your practice until you react smoothly and correctly to any situation you meet. Always ask yourself these questions

about each operation of seeing, judging, and manipulating:

(1) "Did I do that correctly?"

(2) "How could I have improved it?"

b. If you do this, you will become rapidly an expert combat driver.

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